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Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

Watching George Do It

The never satiated curiosity of the man in the street in regard to any type of construction going on in the neighborhood has been commented on in this column ere now. We thought perhaps that, with construction on our mind, we are oversensitive to this manifestation of man's thirst for knowledge, or perhaps his desire for a legitimate excuse for doing nothing, but one of the wandering photographers for *The Rockefeller Center Weekly* seems to have been caught up in the net of curiosity as well. He was so intrigued that he photographed the scene, which was done the honor of a position on the front cover of the Weekly.

"Labor Is Art"

Under this heading, the following comment appeared in the same issue.

"The gentleman in the straw hat seems to have what we would consider *the* ideal job. We have the word of Wendell McRae who took the picture that he stood for at least half an hour, quite immovable, in the pose depicted, occasionally offering words of encouragement to the carpenter also shown, who is engaged in making concrete forms or something of the kind for one of the curbings of the International Building.

"This we consider approximate perfection in the line of an occupation, indicative of a widespread acceptance of the ideals of dignity and repose in human labor which are making such advances in our world today.

"Unfortunately, our information as to the gentleman is a bit hazy and inexact, our Mr. McRae not having gotten around to asking for specific details as to identity and profession. Perhaps he had another job and was

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Photo, Courtesy of Rockefeller Center Weekly

S.R.O. at the Construction Show

Roads in Africa

Work in Dark Continent Where Roads Are Scarce Creates Highways from Old Trails and Routes

(Photos on page 36)

THE eyes of the world are now focussed on the "Dark Continent," particularly on that section on which Mussolini's eyes have rested covetously for some time—Ethiopia. Il Duce has proclaimed long and loud Ethiopia's dire need of economic and social development. If the roads of a nation were the only indication of its civilization, Il Duce would be right. One wonders whether lack of roads might not be preferable, if such a condition would keep out the questionable benefits of Il Duce's brand of civilization. In any case, great sections of Africa have always been closed to the acknowledged benefits of civilization because of lack of transportation facilities.

Africa is a land of paradoxes. Its terrain and climate run the gamut from hot, burning desert, through luxuriant steaming jungles to dry cold wind-swept mountains and plateaus. "Believe It or Not" Ripley reports that in the country of Ethiopia are found the highest and the lowest temperatures recorded anywhere, ranging from 168 degrees above to 150 degrees below zero. A party of people froze to death on the equator, under a tropical sun, on top of one of the Ethiopian mountains. These contrasts have presented great obstacles in the development of land communications and explain why Africa has less road per square mile of territory than any other continent.

Mileage Increasing

However, in 1933, twenty-two countries in Africa increased their highway mileage. Although many were small increases, they indicate progress. The countries showing increases are:

Country	Increase in Road Mileage
Algeria	10,899
Angola	6
Belgian Congo	11,114
British So. Africa (No. & So. Rhodesia)	3,890
Canary Islands	225
Eritrea	200
French Eq. Africa	3,757
Gambia & Protectorate	5
Libya	688
Madagascar	2,084
Madeira	8
Morocco, Fr.	1,439
Morocco, Sp. and Int. Zone	143
Nigeria	450
Reunion	18
Seychelles	106
Somaliland, Br.	5
Somaliland, It.	1,380
South Africa, Union	850
Tanganyika	6,335
Uganda	1,167
Zanzibar & Pemba	7

Twenty-five miles added for French Somaliland and 817 miles for British Southwest Africa are reported for the first time.

Decreased mileages are noted for the following countries:

Egypt	27
Ethiopia	10
Gold Coast	157
Kenya Colony	222
Mozambique	185
Nyasaland	725
Tunisia	48

(Continued on page 11)

Rock and Quicksand Licked by Contractor on 2-Mile Sewer Job

C. & E. M. Photo

Driving Sheeting for Excavation Ahead of the Wellpoint Installation

SOILS running from rock to quicksand and "sometimes mixed," as the contractor put it, are found in Westchester County, New York, lying just to the north of New York City. On PWA Project 8827-X, in the construction of an intercepting and trunk line sewer, 11,610 feet in length, of 24 and 36-inch reinforced concrete and 36-inch cast iron pipe, the Standard Improvement Corp. of Westchester County used extensive pneumatic drilling equipment and, near by, resorted to wellpoints to keep quicksand from boiling through a thin layer of hard pan which was punctured during the driving of the sheeting.

Extent and Route of Project

This sewer was built by the town of Greenburgh, New York, to eliminate a pumping station at the north boundary of the city of Yonkers. The project includes 7,400 feet of 36-inch and 2,500 feet of 24-inch reinforced concrete pipe and 1,710 feet of 36-inch cast iron pipe. The sewer runs from the north limits of the City of Yonkers along Central Park Avenue, up Canfield Street, through a private right-of-way around the reservoir of the New Rochelle Water Co. and through various private streets, connecting with the Westchester County sewer on the Bronx River Parkway. The sewer was laid on grades of 1 in 10 to 13 in 100 for the 36-inch pipe and 22 in 100 for the 24-inch pipe.

Rock Sections

On the rock sections the depth of trench varied from 18 to 26 feet and was uniformly 7 feet wide. The contractor used a Lorain 75B for stripping the loose rock and earth. Six Ingersoll-Rand compressors, three 210-foot and three 320-foot, with Ingersoll-Rand and Chicago Pneumatic jack hammers, one I-R wagon drill and sheeting hammer

Varied Ground Presented Many Problems to Solve in Construction of Sewer in Westchester County

were used. The drill steel was 1½-inch throughout with I-R detachable jack bits. The holes were loaded light with 40 per cent Atlas dynamite, using steel mats to cover the charges. The local restrictions are very stringent on the use of explosives. A backhoe on one of the Lorains was used after shooting and a crane was used to snake out the large size stone.

The reinforced concrete pipe, in 8-foot lengths, was delivered by the Lock Joint Pipe Co. of Ampere, N. J., from a plant nearby in White Plains, N. Y., and by the Core Joint Pipe Co. which manufactures pipe in the borough of the Bronx, New York City. Both pipe companies delivered the lengths to the job, four lengths per truck load.

The pipe was lowered into the trench with a Northwest crane and set on concrete grade blocks and then a cradle poured around the lower section of the pipe. The cradle concrete was mixed in a Ransome mixer which was run alongside the trench. In the rock cuts, dirt was hauled from other trenches and hand tamped to 2 feet over the top of the pipe, then two Austin backfillers completed the filling of the trench.

Sections in Soft Ground

The trench in soft ground was excavated to a width of 8 feet and in depths varying from 10 to 26 feet with a Lorain backhoe. For sheeting, the contractor used a 2-inch short leaf pine 8 to 10 inches wide and from 16 to 20 feet

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"Prevent" Is the Word at N. Y. Intersection

By J. S. BIXBY, District Engineer, Division of Highways, New York Department of Public Works

(Photo on page 36)

State Highway Department Designs Grade Separation to Make Two Main Routes Free from Hazards

WHERE important traffic arteries meet, safety equipment must be provided and, undoubtedly, the most adequate and complete solution of such a condition is the separation of grades. The Division of Highways of the New York Department of Public Works is planning for the future growth of its highway system by inaugurating a grade crossing prevention program, as well as a program of elimination of existing grade crossings.

In Rockland County, about a mile west of Nyack, N.Y., such a condition was anticipated at the intersection of the Nyack Turnpike, carrying eight to fifteen thousand vehicles a day, and the new Route 303 which is designed as a future by-pass around the Village of Nyack for a large part of Route 9W traffic, when adequate connecting facilities are afforded in New Jersey. To take care of this intersection, the State Highway Department designed the largest and most elaborate grade crossing separation between New York and Albany on the west side of the river, with two main 40-foot concrete highways connected by four 20-foot concrete access drives designed so that all vehicles can keep to the right with no crossing of traffic.

To meet local conditions and to reduce the cost of right-of-way, the separation was designed elliptical in shape, the major axis running north and south. The east and west-bound route was elevated and crosses at 14 degrees 25 minutes skew over a rigid-frame stone-reinforced concrete arch structure of 55-foot span and 57 feet wide.

The contract was awarded November 9, 1933, to Miller Brothers Construction Co., Inc., and work was started December of that year to make the necessary fills for the approaches and access drives, so that the fills would be fully consolidated by the time the concrete pavement was placed. Work on the bridge was started in January, 1934, and little progress was made during the winter months, due to the severe cold weather. The project was completed November, 1934, but was not opened to traffic until the spring of 1935.

Design of Bridge

The bridge is a rigid stone-faced reinforced concrete arch similar to the type used on the Westchester County, N.Y., Parkways with the exception that the arch ring is of concrete with a bush hammered finish.

Locally-dressed quarried stone was used for the stone work with a fine-pointed medium grey granite belt course and coping for contrast. One hundred and sixty-five cubic yards of local stone masonry was used at a contract price of $45 per cubic yard, and 18 cubic yards of dimensioned masonry at $105 per cubic yard.

The approach walls were carried down to a reinforced concrete footing 4 feet below the finished slope line, and this footing was supported by means of reinforced concrete pedestals resting on rock.

The reinforced concrete abutments rested on rock at approximately the elevations indicated by core drills taken in the preliminary survey, which indicates the importance of core drilling for bridge foundations.

Construction

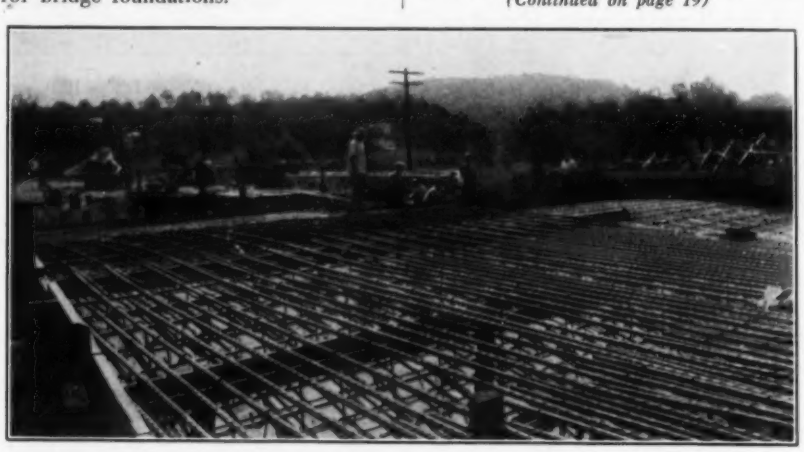
Little difficulty was encountered in pouring the abutments. It was necessary to cut out a shelf in the solid rock of approximately 2 feet 6 inches wide and 1 foot deep for the concrete footing to rest on. Great care had to be taken that the shelf would be approximately the required size after blasting. This was accomplished by drilling holes fairly close together and using very light charges.

In pouring the concrete for the abutments from a height of about 25 feet, elephant trunks with baffle boards were used. No shoveling of concrete between the forms was permitted, and the men were instructed to use boots to agitate the concrete.

Artificial sand was used in a mixture of 1:2:3½, and it was found that it was very difficult to give the exposed surface the proper finish.

The backs of wing walls were treated with a cold application of bituminous material waterproofing at the rate of 4 gallons per 100 square feet of

(Continued on page 19)



Reinforcing for the Flat Arch of the Grade Separation Structure at the New York Route 303 and Nyack Turnpike Intersection

Dams Versus Floods on Muskingum Project

War Department Builds Conservancy Dams With Flood Control Features in Eastern Ohio

THE intense rains of August 7-8, 1935, made heavy inroads on the construction program of the Muskingum Conservancy District which is building thirteen great earth dams and one concrete overflow dam to control the streams tributary to the Muskingum River, a watershed of 8,038 square miles or one-fifth the area of Ohio. This huge project is to cost $22,090,000, the appropriation having been made available to the War Department through the Public Works Administration in December, 1933, and the money became available April 30, 1934.

This series of fourteen reservoirs is designed to store the flood waters to spillway elevation without overflow. The basis of computation was the historic five-day storm of March, 1913, which was approached in intensity by the fourteen-hour storm of August 7-8, 1935, when construction activity was at its height on all fourteen dams.

The dams of the Muskingum project involve 10,000,000 cubic yards of earth excavation, 1,000,000 cubic yards of rock excavation, 9,000,000 cubic yards of earth embankment, 700,000 cubic yards of rock fill in toe trenches, 400,000 cubic yards of concrete in cut-off wall spillways, tunnel lining, the gravity dam and other structures. In addition the project includes $6,000,000 railroad relocation and $2,000,000 public utility relocations, and 40,000 cubic yards of rock tunnel, and will employ 8,000 men for a total of 15,000,000 man-hours. The tables below give the main features of each dam and later articles will describe the methods of construction used by contractors on the various dams.

Personnel

The design and construction of the Muskingum Conservancy Project are under the direction of the Corps of Engineers, U.S.A., with Major J. D. Arthur, Jr., as District Engineer. Theodore T. Knappen, Senior Engineer, is Chief of the Engineering Division in charge of engineering.

Dam	Contractor	Bids Opened	Contract Awarded	Contract Price	Working Days	Area Engr.	Resident Engr.
1. Tappan	Sammons & Robertson	Nov. 13, 1934	Nov. 24, 1934	$ 387,450.00	365	S. M. Baily	
2. Charles Mill	Ryan & Myers	Nov. 15, 1934	Nov. 24, 1934	313,894.80	365	J. M. Belknap	N. G. Fasnacht
3. Wills Creek	Edward J. Eiff Co.	Nov. 21, 1934	Jan. 22, 1935	628,007.50	700	Capt. F. S. Tandy	1st Lt. F. X. Purcell, Jr.
4. Clendening	R. Giavina	Jan. 31, 1935	Feb. 5, 1935	292,335.00	320	S. M. Baily	C. S. Joslyn
5. Beach City	Wm. Eisenberg & Sons	Feb. 21, 1935	Feb. 26, 1935	843,514.10	600	Capt. A. C. Lieber, Jr.	N. R. Moore
6. Mohawk	Geo. M. Brewster & Son	Mar. 19, 1935	Mar. 27, 1935	1,720,664.00	800	Capt. F. S. Tandy	N. F. Dorch
7. Senecaville	J. A. Mercier Co.	Apr. 2, 1935	Apr. 12, 1935	329,280.60	600	Capt. F. S. Tandy	W. B. House
8. Piedmont	Hamer Bros.	Apr. 10, 1935	Apr. 19, 1935	442,725.00	570	S. M. Baily	T. D. Oakley
9. Mohicanville	Winston Bros. Co.	Apr. 30, 1935	May 10, 1935	284,017.65	570	J. M. Belknap	McK. F. Johnson
10. Dover	Bates & Rogers Constr. Co.	May 3, 1935	May 14, 1935	957,262.00	700	Capt. A. C. Lieber, Jr.	W. L. Whittemore
11. Leesville	Culbertson Constr. Co.	May 24, 1935	June 3, 1935	450,871.00	550	S. M. Baily	M. D. Bell
12. Pleasant Hill	Newhall-Herkner Constr. Co. & Peter Herkner	June 24, 1935	June 28, 1935	918,632.00	700	J. M. Belknap	Robert F. Olds
13. Atwood	W. L. Johnson Constr. Co.	June 26, 1935	July 3, 1935	311,411.00	520	Capt. A. C. Lieber, Jr.	R. A. Sterzik
14. Bolivar	Minder Constr. Corp.	June 27, 1935	July 2, 1935	1,546,375.00	800	Capt. A. C. Lieber, Jr.	Capt. W. W. Bessell

Dam	Stream	Type	Length (Feet)	Height (Feet)	Foundation	Spillway	Outlet Type	Outlet Gates No.	Outlet Gates Ft.	Drainage Sq. Miles	Storage (Acre—Feet) Flood	Storage (Acre—Feet) Conservancy	Excavation (cubic yards) Common	Excavation (cubic yards) Rock	Excavation (cubic yards) Tunnel	Embankment (cubic yards)	Concrete (cubic yards)
1. Tappan	Little Stillwater Creek	Earth	1,550	52	P.F.**	Saddle	1 Tunnel	3	3—3½x7	71	26,500	35,100	104,000	39,000	1,750	450,000	3,500
2. Charles Mill	Black Fork	Earth	1,390 (Dam) 1,840 (Dike)	50	R.* and P. F.	Conc. Overflow	5 Short Conduits	5	3—3½x7	216	80,600	7,400	187,000	17,000	None	247,000	15,810
3. Wills Creek	Wills Creek	Earth	1,950	60	P.F.and I.P.F.†	Side Channel	2 Conduits	6	7x15	844	190,000	6,000	540,000	152,000	None	555,000	25,500
4. Clendening	Bushy Fork	Earth	1,050	62	I.P.F.	Saddle	1 Tunnel	3	3—3½x7	70	26,100	27,900	70,000	98,600	1,900	331,000	5,300
5. Beach City	Sugar Creek	Earth	1,500 (Dam) 4,100 (Dike)	60	P.F.	Saddle	2 Conduits	6	7x15	300	70,000	1,700	575,000	125,000	None	957,000	39,800
6. Mohawk	Walhonding River	Earth	2,400	100	P.F.	Saddle	2 Tunnels	6	8x17	1,501	285,000	None	1,300,000	475,000	16,000	2,198,000	50,550
7. Senecaville	Seneca Fork	Earth	650 (Dam) 1,600 (Dike)	50	I.P.F.	Conc. Overflow	2 Short Conduits	2	3½x7	121	45,000	43,500	186,000	50,000	None	413,000	15,000
8. Piedmont	Stillwater Creek	Earth	1,740	56	I.P.F.	Saddle	Tunnel	4	3½x7	84	31,400	33,600	174,000	87,400	3,300	804,500	7,250
9. Mohicanville	Lake Fork	Earth	1,220	40	R. and I.P.F.	Conc. Overflow	3 Short Conduits	3	7x12	269	102,000	None	310,000	23,000	None	295,000	14,100
10. Dover	Tuscarawas River	Gravity Concrete	820	80	R.	Conc. Overflow	18 Short Conduits	12 6	7x7 5x10	1,397	202,000	1,000	112,000	37,000	None	None	102,000
11. Leesville	McGuire Creek	Earth	1,650	65	P.F.	Side Channel	2 Short Conduits	2	3½x7	48	17,900	19,500	384,000	64,600	1,800	618,000	8,250
12. Pleasant Hill	Clear Fork	Earth	775	130	R. and P.F.	Saddle and Morning Glory	1 Conduit	2	3½x7	199	74,200	13,500	75,000	76,000	18,000	907,000	20,400
13. Atwood	Indian Fork	Earth	3,800	55	R. and P.F.	Side Channel	2 Short Conduits	2	3½x7	70	26,100	23,600	217,000	69,000	None	271,000	12,300
14. Bolivar	Sandy Creek	Earth	6,200	82	P.F.	Saddle	2 Tunnels	6	7x15	502	149,600	None	494,000	75,500	20,000	2,004,000	35,550

*—Rock. **Pervious Foundation. †Impervious Foundation.

Good Roads Pay Dividends and Here's Positive Proof

Direct evidence that a state and its citizens derive major economic benefits from highway improvement is provided by the results of a survey of traffic on Florida state highways, conducted by the U. S. Bureau of Public Roads and reported briefly in Highway Highlights of the National Highway Users Conference. A portion of the official report is presented under the heading "Large Expenditures Made by Tourists."

Tourists staying at hotels and in their own homes are estimated to spend the largest amounts, the expenditures of each of these groups amounting to nearly $28,000,000 a year. On the average, each tourist car travels about 1,000 miles in Florida during a visit, or 515,000,000 for the total traffic. At 14 miles a gallon, 36,786,000 gallons of gasoline are consumed, yielding $2,575,000 at the current tax rate of 7 cents a gallon. This amounts to about 16 per cent of all gasoline taxes collected within the state.

In addition to the financial benefits outlined by the report as accruing to Florida and its citizens as the result of tourist travel attracted by good roads, consideration must be given to the further benefits which Florida's people have gained from their own use of the state's modern highway system.

PROVES LOW UPKEEP on 1,200,000 SQUARE YARDS

Lafayette Ave., Buffalo, N.Y. One of this city's Texaco Sheet Asphalt pavements.

Average annual repair cost 1/3¢ per square yard

Let's get down to cases on the question of pavement upkeep.

Buffalo, N. Y., had 1,200,000 sq. yds. of TEXACO Sheet Asphalt pavement between six and ten years old. During 1933 and 1934, nothing whatever had been spent on the entire yardage for maintenance.

In 1935, when bids were received for repairing the 1,200,000 sq. yds., award was made on a price of one cent per square yard. The average annual repair cost for the 3-year period, therefore, was ⅓¢ per sq. yd.

Here is a significant demonstration of low upkeep, involving a substantial yardage of TEXACO Asphalt paving, on the streets of New York State's second largest city.

TEXACO

THE TEXAS COMPANY, Asphalt Sales Department, 135 East 42nd Street, New York City

CHICAGO CLEVELAND KANSAS CITY HOUSTON DALLAS BUFFALO PHILADELPHIA RICHMOND BOSTON JACKSONVILLE

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Maintenance of Roads at Curves

In driving over 80,000 miles in our work in the last eight years, we have noted one outstanding fault in highway maintenance which is quite universal and yet which is entirely unnecessary. This fault is found more generally on the older and widened bituminous roads but is also found on the older concrete roads which have been patched on the inside of curves.

We refer to the presence of rough riding pavement, particularly corrugated patches and widening stripes, on the inside of curves ordinarily navigable at speeds of 30 to 40 miles per hour. An automobile driven at less than the legal speed on such corrugated curves performs remarkable gyrations. The rear wheels bounce and because of centrifugal force tend to move toward the outside of the curve which immediately changes the direction of the motion of the car. Unless the driver corrects this motion by turning his front wheels in the direction in which the rear wheels have moved, as in getting out of a skid on a slippery pavement, he will find himself heading for the ditch on the inside of the curve.

There seems to be no reason why the inside of curves on hard surfaced roads cannot be maintained in a smooth condition. The reason for failure to do this is undoubtedly because maintenance crews do not realize the greater importance of a smooth surface on the inside of a curve. We hope that the maintenance divisions of state highway departments will impress this fact upon the local district maintenance crews.

The PWA Situation

The 3,500,000 men who are expected to be put to work by November 1 under PWA and WPA are not at work as was expected. The endeavor to rush through such a tremendous employment program in such a short time and with a diversity of opinions as to how it should be handled, and particularly the PWA versus WPA controversy, necessarily resulted in delays.

We are generally heartened though by the liberalization of the rule which required that 90 per cent of all direct labor on PWA projects must be taken from the relief rolls. Now when the men are not available, labor may be secured elsewhere. Also, with PWA, local officials are given more discretionary power as to rates of pay. This should speed up the WPA program as there has been altogether too much wrangling and buck passing under the wage rate schedule fixed by the President since the beginning of the program.

On October 3 Federal funds were employing 559,640 men in the Civilian Conservation Corps, 452,739 through Works Progress Administration jobs, leaving 113,855 employed by PWA and other agencies.

Possibly as offering a legitimate excuse for transferring more of the $4,000,000 work relief appropriation to WPA, the President demanded that all local bodies must get their PWA projects under way by December 15. This order completely upset municipal bodies in particular and many projects of legitimate value which had not actually reached the design stage were rushed through with the most sketchy plans. This will inevitably result in great disappointment in many municipalities because these projects will inevitably be turned down by state PWA administrators.

The Construction League of America offers the following breakdown of the PWA projects by types showing the total of grants allotted to each. In spite of an increase from 30 per cent to 45 per cent in grants and with the total number of projects approximately the same, grants under the old program amount to $950,000,000 as compared with $330,000,000 under the new program.

Type of Project	*Number Of Projects*	*Grant*
Streets & Highways	198	$ 15,989,743
Sewer Projects	366	54,899,058
Sewer & Water	35	1,742,211
Water Systems	529	30,098,535
Garbage & Rubbish Disposal	11	1,112,043
Gas Plants	13	583,735
Electric Power	86	8,073,355
Communications	2	146,863
Railroads & Car Lines	2	1,561,250
Miscellaneous Utilities	28	1,980,576
Educational Buildings	2,133	130,696,188
Municipal Buildings	109	8,817,714
Hospitals & Other Institutions	158	21,660,636
Penal Institutions	16	474,464
Social-Recreational Buildings	10	139,322
Residential	1	29,000
Office & Administrative	13	581,125
Warehouses, Laboratories, Shops	10	398,530
Miscellaneous Buildings	70	7,203,210
Flood Control, Water Power & Reclamation	30	11,233,970
Water Navigation Aids	4	340,310
Engineering Structures	69	15,494,649
Aviation—Physical Improvements	2	1,951,074
Recreational	12	1,414,035
Miscellaneous	67	13,231,700
TOTAL	3,965	$329,858,296

THE PENALTY OF DECREPIT EQUIPMENT

C. & E. M. Photo

A Breakdown of a Crane at the Batching Plant Kept Twenty-Four Trucks Idle. The Cost to the Contractor for Lost Time Such as This May Be Far Greater Than the Cost of New Equipment.

Highway Industry Now "Over the Top"

The final day of the period during which applications could be filed for Road Show space brought applications for more than 25,000 square feet of space, setting an all-time record and bringing total reservations to within 5 per cent of the maximum space available in Cleveland's New Exhibition Hall, it has been announced by the American Road Builders' Association.

The Convention-Road Show will be held January 20-24, this being the first Road Show scheduled since 1933, the year that marked low tide in highway construction for the last decade.

The Road Show is accepted by the entire highway industry as the barometer of highway and street construction, and the fact that the 1936 Road Show was a "sell-out" three months in advance is considered by A.R.B.A. officials as conclusive evidence that the industry is "over the top."

At the same time as these announcements about the Road Show, the U. S. Bureau of Public Roads announced that highway projects have been approved in forty-three states which have submitted programs for regular Federal Aid and Emergency Relief Funds, and that additional projects involving millions of dollars are being approved daily.

The Works Progress Administration has announced that approval has been given to farm-to-market road projects for a total of $164,000,000 and municipal street projects for approximately $184,000,000.

Grade crossing projects are moving more slowly, but several states have had their grade crossing programs approved, and this phase of construction is expected to move rapidly.

Discussing prospects for the Road Show and the progress of highway programs, Charles M. Upham, Engineer-Director of the A.R.B.A., said,

"We no longer have to guess how the highway industry is getting along. We know. Uncertainty of highway appropriations for a time, and subsequent confusion injected by rules and regulations covering relief labor, made the 1936 Road Show a question until two months ago. But with the uncertainty of funds removed and the highway employment regulations amended to provide a workable basis, the industry moved rapidly back into its old-time stride.

"The American Road Builders' Association, in support of the Hayden-Cartwright Act, told Congress that a three-year highway program would stabilize the industry and bring highway contractors back into the market for new equipment to replace machines that were being held together by baling wire and other make-shift methods of repair. The Act was passed and today the highway industry is back on its feet with steadily growing demands for every type of modern equipment."

When an Accident Occurs, Search for the Cause

The control of accidents may be accomplished in exactly the same manner as shrinkage, poor quality or any other waste control, is the belief of the officials of the Westinghouse Lamp Co., by a search for the reason. When material efficiency is poor, the equipment is gone over to see if that is the cause; the stock is examined to locate any defects in materials, and the operators' work is checked to determine if the manner of doing the work causes the shrinkage.

The same may be said about efforts to locate quality troubles; and the same method should be followed in the control of accidents. When an accident occurs, there is something wrong with machinery, materials or man.

Indiana Looks Ahead

The importance of road-building activities to the taxpayers of a progressive state and the responsibility of the state highway commission in planning as well as spending have been given deep thought by J. D. Adams, Indiana State Highway Commission Chairman.

Commission's Objectives

The objectives of Indiana's Highway Commission, as set forth by Mr. Adams, are safety, convenience, cost control and efficiency in construction and maintenance in relation to population changes, and the advance of rural electrification.

Stressing safety on the highway as a paramount issue confronting the nation, Mr. Adams has compiled data from Indiana records to show that the widening of Indiana highways had definitely reduced the number of fatalities. The entire state of Indiana made one of the best records of any state in the Union during 1934 in holding down the percentage of increase of automobile fatalities. Whereas the percentage of increase for the country as a whole during the first ten months of 1934 was 16 per cent, the figure for Indiana was only 11.2 per cent.

Widening Highways Not Enough

Widened highways, although they help, are not the ultimate solution.

"If we are to look the future squarely in the face," Adams said, "we must realize the necessity of divided highways. By this is meant parallel roadways. Each of the lanes would be 20 feet or more in width, one lane carrying east-bound traffic and the other west-bound. A distance of perhaps 50 feet should separate these two lanes. By dividing these roadways, the danger of the head-on collision would be eliminated, the number of side-swipe accidents would be tremendously reduced, the glaring headlights would no longer be a peril to the motorist, and it is easy to believe that the number of our fatalities would be greatly reduced."

Records show that the 30-foot or 40-foot roadway does not eliminate the danger of a crashing head-on smash. "Certainly," said Mr. Adams, "a 16 per cent increase in motor fatalities throughout the nation in 1934 over 1933 is pretty good proof that it would be a business investment in the saving of lives and property damage to look to the future and lay plans to divide our most heavily-traveled lanes. Our principal railroads are double-tracked. Are our highways less important?"

Watch Your Shirt!

The National Social Security Act, approved by the President on August 14, levies payroll taxes on wages, salaries, bonuses and every other kind of remuneration to all employees including executives. The Act imposes two distinct taxes upon employers of eight or more persons and an employee's income tax to be collected by the employer, the first tax on the employer becoming effective January 1, 1936 and amounting to 1 per cent on the 1936 payroll.

While there is some question as to the constitutionality of the Act, and some of the provisions are confusing, which may cause changes and amendments at the next session of Congress, the safe thing will be to keep this in mind when bidding on jobs which will run into 1936, making allowance for the payment of this tax when making the bid. On work running into 1937 and thereafter, the rates increase and ultimately will reach a total of 6 per cent.

Hawaiian Lava Rock From Cliff to Job

Volcanic Rock of Islands Presented Unusual Problem During Construction of the Port Allen Breakwater

(Photo on page 36)

As part of a project to improve the harbor of Port Allen, principal gateway to the Island of Kauai, Hawaii, a breakwater of rubble-mound construction, 1,200 feet long and comprising about 208,000 tons of rock, has recently been built. The project also includes dredging the harbor to a depth of 35 feet. This improvement will make it possible for the large freighters calling at the island, most of which must anchor outside the harbor and unload cargoes on lighters, to carry on in spite of rough weather, which up to now has stopped all operations.

Construction of Breakwater

Three different classes of rock were required in the construction of the breakwater, as follows:

Class C stone, quarry run except that not more than 5 per cent by weight of any barge or car load shall be of earthy matter.
Class B stone, quarry run of not more than 20 per cent by weight in pieces of less than 100 pounds each and not less than 30 per cent by weight in pieces weighing 2 tons or more each.
Class A stone, quarry run, in pieces not less than 2 tons in weight, and of which not less than 50 per cent by weight shall be in pieces weighing not less than 6 tons each, with an average weight of 8 tons each.

All stone shall weigh not less than 150 pounds per solid cubic foot.

The total estimated quantity of stone required was

Class A	58,600 tons
Class B	74,500 tons
Class C	74,900 tons

Because of the necessity for speed, the contractor decided upon the trestle method of construction, using two stiff-leg derricks of 20-ton capacity running on tracks to handle all the rock. A pile-driver worked ahead of the derricks, driving eight-pile bents spaced 14 feet apart.

A fleet of six International trucks hauled the rock from the quarry to the breakwater, supplemented at various times by two or three smaller hired units. Four of the trucks, equipped with 7-yard dump bodies, were used especially for waste, Class C and the smaller Class B stone while the other two trucks, with flat wooden bodies, handled the Class A and the larger Class B stone.

Most of the rock hauled in the dump trucks was loaded directly into a 12-ton iron skip which was picked up by the derrick and dumped into the water. In some cases, it was possible to dump directly from the truck into the water. All rock hauled on the flat trucks was chained individually and tripped into the proper location, if the rock went below the water line. All rock above the low-water line, in 6 to 18-ton blocks, was picked up again by means of dog-hooks and carefully placed on the slope. The top of the breakwater was built 6 inches above the required elevation to allow for settlement.

Quarrying Volcanic Rock

Quarrying was difficult because of the peculiar rock formation of the islands, most of which are almost entirely of volcanic origin and consisting for the most part of thinly bedded basaltic flows with a high percentage of clinker, some ash and numerous cooling cracks or fractures.

A quarry in a gulch a mile from the breakwater and connected by a paved road built through a sugar-cane field was finally selected after extensive geological investigation and systematic exploration by diamond drilling. The bottom of this gulch was covered with a 10 to 15-foot layer of mud which made the initial quarrying operation extremely difficult as it was necessary to make a 6 to 8-foot mat of waste to hold up the shovels and cranes.

Just After Loading a Charge at Point Quarry. With Apparently Favorable Conditions for a Good Shot, an Unexpected Cinder Pocket Near the Charge Made the Blast Less Resultful Than Had Been Expected

The quarry face was 50 to 70 feet high with an overburden of 5 or 6 feet of earth, which was removed by sluicing with high-pressure jets. Nearly one-half of the rock excavated was waste, because it had adhering clinker, was too porous or was of the wrong size.

Two Bucyrus-Armstrong drills with 6-inch steel were used. Despite the difficult drilling through ledges and cinder pockets, not a bit or tool was lost on the job.

Blasting

As the production of large rock, about 10 to 12 tons each, was the most important requirement, the blasters found it necessary to underload to avoid excessive breakage and to use black powder to avoid shattering. The quarry was within 200 yards of the ocean with the floor just slightly above high tide; consequently sub-drilling was impossible and extreme care was required to stop drilling before the water table was reached to avoid wetting the black powder when blasting.

Before each round, the face was

(Continued on page 22)

NO OTHER WELDED BOOM BRINGS YOU THE STRENGTH of this

● There has been a lot of *talk* lately about welded booms!

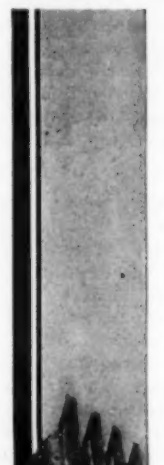
All welded booms are *not alike.* There is a difference even in welding! Northwest developed the welded shovel boom and no other manufacturer has carried its design and refinement to an equal extent.

Northwest booms are true box sections not to be compared with trough section booms referred to as box section.

The welding design is of a type selected to withstand the terrific twisting stresses to which a shovel boom is subjected and assures building on clean and sound metal. It cannot transmit the failures of individual welds and is far superior to combinations of welding or welding and riveting.

Even though Northwest Welded Booms cost more to build than old style riveted booms, you pay no extra premium.

Remember, in the three years they have been built there has never been a Northwest Welded Boom failure.



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GASOLINE, OIL
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BUILT IN A RANGE OF 12 SIZES — 1/2 YD. CAPACITY AND LARGER

Shuttling Concrete at Norris Dam

Moving Concrete from Mixing Plant to Cableway Largely Automatic with Electrical Control

(Photo on page 36)

AVERAGING 3,600 cubic yards of concrete a day, three 9-ton gasoline electric locomotives and three electrically-operated dump cars are transporting the concrete between mixing plant and cableway loading stations at TVA's Norris Dam. Approximately 650,000 cubic yards of concrete have been transported to date.

Four Plymouth gasoline-electric locomotives and three Insley electrically-operated dump cars, the latter receiving power from the locomotives, are used. This arrangement, according to R. W. Monroe, Westinghouse engineer, eliminates the use of trolley wires and feeder systems which would be undesirable on a construction project of this type because of the interference with surface operation.

Concrete Mixing Plant

The concrete mixing plant is located on the left bank of the river upstream from the dam site. A loading platform built of timber is located on the river side of the track on which the cableway buckets are placed while being loaded from the transfer cars. A track system extends from the concrete mixing plant to the loading platform, parallel to the river with the necessary back switches to permit rapid handling of the trains. This track is located between the tracks along which the cableway towers move and the river bank, the cables spanning the track.

Transportation Equipment

Each transportation unit consists of one 9-ton gasoline-electric locomotive hauling a single car with two hoppers, each of which is tilted by an individual electric motor. These units are in constant service with one extra locomotive for a stand-by. On the job, one train is loading concrete at the mixing plant, the second is discharging its load into the cableway bucket and the third train is standing on the switch.

The hoppers, when tilting, discharge into a chute, the latter discharging from the under side of the car into the cableway bucket. The two hoppers can be operated individually or dumped simultaneously, controlled from the engine cab. One of the buckets is connected through a mechanical leverage system to the chute so that as the hopper begins to tilt the chute is lowered into the cableway bucket. After this hopper is fully tilted the operator starts to tilt the second hopper. After the second hopper has been emptied, both hoppers are returned to their seated position and the train is started back to the mixing plant.

Each hopper has a capacity in excess of 4 cubic yards. The average load per hopper is about 3 cubic yards of concrete, and with this load approximately 7 seconds are required for tilting and about the same time for returning the empty hopper to its seated position.

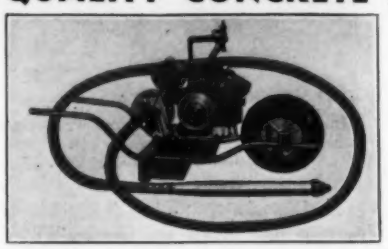
Each locomotive is powered by a 90-hp Buda gasoline engine direct-connected to a Westinghouse compound wound generator. Each dump car uses two 15-hp HK hoist-type motors equipped with magnetic brakes, each motor driving its individual hopper through a geared speed reducer.

New Dealers for Chain Belt Co. in Chicago and Birmingham

The F. H. Burlew Co., 221-225 W. Huron St., Chicago, Ill., has been appointed exclusive Chicago distributor of Rex construction equipment, manufactured by the Chain Belt Co., of Milwaukee, Wis. F. H. Burlew, President of the company, has been identified with the construction machinery industry in the vicinity of Chicago for many years.

The Chain Belt Co. has also announced the appointment of the J. D. Pittman Tractor Co., 520-30 No. 28th St., Birmingham, Ala., as exclusive distributor for Rex construction equipment in the Birmingham area. This company, which was organized in 1927, handles a complete line of contractors' equipment.

QUALITY CONCRETE AT REDUCED COSTS
WITH
MALL CONCRETE VIBRATORS



Eliminate honeycombs and expensive patching.
Secure a better bond between reinforcing steel and concrete.
Illustrated: MALL 3 h.p. gas engine countershaft driven, pneumatic wheel mounted vibrator unit. This machine delivers maximum vibration frequencies of 4500 per minute.
Recommended for pavements, bridges, buildings, culverts, and other types of structures where extreme portability is essential.
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NEW CHEVROLET TRUCKS

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SPECIAL EXHIBIT OF NEW CHEVROLET TRUCKS

Accept this invitation to visit your Chevrolet dealer and a special exhibit of new Chevrolet trucks. Ask for complete details of new Chevrolet truck features that offer important transportation economies to truck users in the Building, Construction and Allied Industries.

The new Chevrolet trucks are more powerful, more rugged, thoroughly modern in appearance—and still the world's lowest priced trucks.

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Compare Chevrolet's low delivered prices and easy G.M.A.C. terms. A General Motors Value

THE WORLD'S LOWEST PRICED TRUCKS

AIR COMPRESSOR from FORD PARTS

With the patented Smith Compressor Head you can now build your own Motor-Compressor with 60-cubic feet capacity. Head is furnished with high-speed compressor valves over two cylinders, unloaders and complete instructions for mounting on your Model A or B Ford Motor. These Motor-Compressors are now being used in over twenty states for drilling rock, breaking pavement, riveting, sand blasting, painting, etc.

Write for full information and prices.

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1220 State St. Bowling Green, Ky.

Advertisement

12 Yard Hydraulic Scraper Shows Its Worth in Severe Tests

In a recent road construction job in the west the New Austin-Western 12-Yard Hydraulic Scraper proved its ability to handle rocks ranging up to the size of oil barrels as well as the smaller material for which it was primarily designed.

Because the Austin-Western Scraper's front gate closes and opens hydraulically it was possible to get these boulders back into the scraper pan and the gate closed so that no material was lost during the haul.

Other obstacles to speed of operation were the high altitude of the work (7,000 to 8,000 feet above sea level) and the unfamiliarity of the operator with the new machine.

In spite of these handicaps the scraper was able to average 78.3 cubic yards per hour digging against a 2% grade on a 900-foot round trip haul. Fuel consumption was 3.6 gallons per hour for a Cletrac 80 Diesel Tractor.

Cut and Fill Job in Wyoming

On a 700-foot round trip haul the Austin-Western 12 Yard Scraper averaged 144 cubic yards per hour behind a Cletrac Diesel 80.

On this job the conditions were better than those described above, with the result that 13 to 14 yards of earth were loaded on the majority of these hauls.

The specifications called for spreading the material in layers, of from 3" to 4" thick, which lengthened the usual dumping time to 1 minute per load. The specifications also called for a roller on the fills, but the contractor was able to avoid the use of a roller by using the scraper for this purpose. The engineer on the job stated that the large tires on the scraper compacted the material satisfactorily on fills, and that they were much more solid than the fills made by crawler dump wagons.

By using this tractor-scraper combination the contractor also saved working his blade grader 5 hours a day, as the scraper took out four out of every five banks without the aid of the blade grader. Sod and top soil was also stripped with the scraper which, ordinarily would have been done with a blade grader. An old gravel road bed which had to be removed was so firmly cemented that a rooter was unable to do much scarifying, and the scraper was put in, digging this material without scarifying. This road bed was about 6" deep.

The actual cost of operating the outfit including tractor, scraper, and driver's wages, but not including depreciation on either machine came to 3-1/3 cents per yard.

It is never possible to estimate the cost of one job based on the costs recorded by any previous one. It is interesting to note, however, that given the right conditions the Austin-Western Hydraulic Controlled Scraper is the most economical machine that can be used.

Advertisement

up with the machine. Where conditions permit, Mr. Bryant states he can cut as much as 16" wide by 24" deep. At this rate the elevator casts from 400-500 cubic yards per hour setting an all time record for earth moving in the state.

Austin-Western 12-Yard Hydraulic Scraper in carrying position. See story in first column to the left.

"On the 5-mile job we did between Camilla and Bainbridge, we cast earth

Advertisement

from the sides of the roads to the center, later leveling with a blade grader, and the flow of earth going from where it was to where we wanted it to be was a revelation," said Mr. Bryant.

The elevating grader used on this job is a new type machine made by The Austin-Western Road Machinery Co., Aurora, makers of a full line of road building and dirt moving machinery. Several radical changes from conventional machines have been worked out in order to give this elevating grader bigger capacity in average working conditions. The plow itself is controlled by a hydraulic controlled stiff leg which permits the operator to shove it into the earth and lock it there at any required depth. The width of cut is also easily varied by an adjustable furrow wheel hydraulically operated. Because of this absolute control over the depth and width of the cut maximum digging capacity is always maintained. A specially designed trough conveyor has been designed to handle the increased production of the plow and the weight of the entire machine redistributed on a three-wheel frame in order to take the greatest possible advantage of the machine weight without increasing the load to be pulled.

Austin-Western Hydraulic Elevating Grader loading into 2-½ yard dump cars in Georgia.

Many other features make the new Elevating Grader not only a big producer but the most flexible machine on the market.

GEORGIAN SETS STATE RECORD WITH ELEVATING GRADER

Gets Production as high as 500 cubic yards per hour

Pine Park, Ga.—With its elevator discharging an avalanche of soil, a machine owned by Irving Bryant, contractor, has been making earth moving history in road and street construction in this part of the South.

In taking 2,000 yards from a borrow pit with an 18" by 16" wide cut three trucks per minute were required to keep

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Instant RESPONSE

TO THE TOUCH OF THE OPERATOR IS THE FINAL MEASURE OF A MACHINE'S EFFICIENCY . . .

● As applied to earth moving and road building equipment Austin-Western hydraulic controls supply a response that is as positive and accurate as the hand of the operator. It is as though his hand were extended to reach any part of the machine and endowed with the full power to adjust blade and wheels to the exact angle instantly.

No matter how long the machine has been in service there can be no lag between the shifting of the valve and the action of the part to be moved. This fact becomes obvious when you realize that on a motor grader just one rotating part takes the place of 68 gears and universals—that this one rotating part, the pump, runs in a constantly renewed oil bath.

Four years of pioneering and development by Austin-Western have proved hydraulics the most efficient and the most practical power controls for road building and earth moving machinery.

STANDARD FOR AUSTIN-WESTERN — they are rapidly becoming STANDARD FOR THE INDUSTRY.

Actual photograph of a control bank showing the simplicity of design and the easy action of the control lever on a hydraulic system.

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Please tell me more about hydraulic control applied to (Name of Machine).....
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Plasticized Sulphur As Joint Material

A series of experiments to determine the most satisfactory material for joint filler in the construction of brick pavements was made by W. C. Rueckel, Director of the Research Bureau of the National Paving Brick Association, Engineering Experiment Station, Ohio State University, aided by W. W. Duecker, Senior Fellow of Mellon Institute of Industrial Research.

Bricks were laid in panels one square yard in area on a concrete base and with a sand cushion. The joints between the bricks in the panels were filled with various materials. Excess filler was removed, the panels covered with an electrically heated hood, and the amount of filler extruded was determined after a definite heating period.

The filler materials tested consisted of a bituminous material made from a semi-asphaltic base oil; a bituminous material made from asphaltic base oil; and plasticized sulphur. This material is made by reacting sulphur with organic sulfides, polysulfides or polymers thereof, the properties of the resultant product being controlled by the quantity and type of sulfide selected.

After the filler materials were subjected to heat for three days, it was noted that the asphaltic fillers had exuded considerably while the test panel joined with plasticized sulphur even after prolonged heating showed no signs of the material exuding.

These results warranted the application of plasticized sulphur in the construction of a test brick road on the campus of Ohio State University. This road has been in service since last October and during this time has been subjected to severe cold weather. Observations to date indicate that plasticized sulphur is satisfactory in all respects.

As has already been noted in these pages, a test road is to be laid in Ohio to try out various types of filler. Two types of plasticized sulphur will be used.

Copies of the full investigational report of Rueckel and Duecker may be secured by readers of this magazine direct from Mellon Institute of Industrial Research, Pittsburgh, Pa.

Lamprey Now Sales Manager for Walter W. Field & Son

E. F. Lamprey, well-known in the construction field throughout New England, has joined Walter W. Field & Son, Inc., distributor of contractors' equipment, at 39-51 Hayward St., Cambridge, Mass., as Sales Manager.

Loading the GMC-Grico-Drive Truck at Leesville Dam

Test of Two-Axle Drive Truck on Earth Dam

Out on the Leesville Dam where the embankment is kept thoroughly wet to secure maximum density, trucks find the going rather hard. Recently there was a test of a General Motors truck equipped with a Grico T-23, 2-axle drive and 825 x 20 tires with a 5-cubic yard, 11-foot dump body. The differential was removed from the bottom of the transfer case and the 1.73 ratio changed to 2.02. The final drive ratios for the T-23 Grico before and after the change was made are as shown below.

Speed	*Before*	*After*
8th (high)	8.03	8.03
7	11.03	12.88
6	13.89	13.89
5	19.68	22.28
4	28.75	28.75
3	39.49	46.11
2	52.76	52.76
1	72.47	84.62
Reverse	63.28	63.28
Reverse	86.91	101.49

The combination of no differential in the transfer case and a change from a final drive creeper ratio of 72.47 to 1 to 84.62 to 1 permitted this truck to operate through the very wet earth deposited in the body of the dam, and to maintain a fairly high speed in delivering from and returning to the borrow pit. The truck was also used to haul and dump not only dirt but stone as well. Four trucks thus equipped are operating now at Leesville Dam.

"Savings on Joint Installation"

Thousands of dollars have been saved yearly by using the FLEX-PLANE METHOD to install premoulded, poured, steel ribbon and premoulded ribbon longitudinally and transversely.

Finishing machines 4 to 50 feet for concrete and black top, dowel rod and expansion joint installers, black top spreaders.

LEASED AND SOLD BY

FLEXIBLE ROAD JOINT MACHINE COMPANY, WARREN, OHIO

SAVE CRANE TIME!
FINISH JOBS FASTER!
Make MORE Profit!

For a real conception of fast digging you should see the Williams "Champion" Power-Arm Bucket in action! Exclusive combination of lever and block-and-tackle assures super-power . . . . And shorter cable overhaul cuts time between bucketfuls.

We also build Williams Multiple-Rope Buckets and Dragline Buckets. May we send you bulletins?

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS

The Koehring Wheel Dumptor
for hauling · dumping · spreading

Proven Performance

—in quarry operation for stripping work. 4 of a fleet of 7 Koehring Dumptors hauling and dumping the over-burden at costs lower than any previous method. Front dump, eliminating time-consuming backing and turning, greatly increases production. Repeat orders for this type of work are proof of the efficient and economical performance of Koehring Dumptors.

The automatic kick-out pan insures a clean and speedy dump for any type of material. The load is instantaneously dumped by force of gravity, without mechanical complications.

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Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Picks and Shovels

(Continued from page 1)

only killing half an hour or so loafing in the sun. But, on the other hand, he may have been a bona fide member of the large army of persons always in evidence in the neighborhood of metropolitan building operations who seem to have no other employment than that of watching other people work.

"We have always been intrigued by these persons, nearly all of whom are men. Their numbers and the faithful manner in which they attend their jobs suggest organization. Some day we intend to go more deeply into this matter.

"Perhaps some of these gentlemen are Walking or (Standing) Delegates from the Union of the Unemployed, of which we hear so much nowadays. Perhaps a few are members of the Association of Husbands of Advanced Washer Ladies. Or of the Kibitzers Club. Anyway, we'll try to find out one of these days."

If our friends of *Rockefeller Center Weekly* actually find out more about this, we'll pass it along to you. We're sure you'll want to know!

Gasoline Engine Starters For Diesel Engines

For diesel applications where a gasoline engine has some advantages for starting the diesel, the Hercules Motors Corp., Canton, Ohio, has developed a starting unit for use on both the DHXB 6-cylinder and the DRXB 6-cylinder diesel engines and power units which it manufactures. This starting arrangement is not intended to supplant electrical equipment but was developed for use where it would have advantages over electrical equipment, particularly in foreign markets, or any place where the proper maintenance of batteries is a difficult matter.

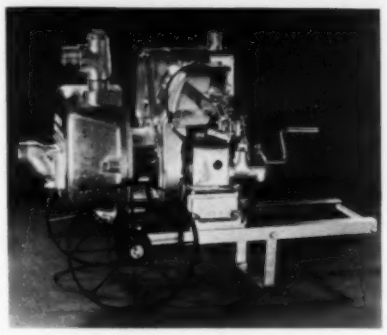
The gasoline engine used is the Hercules Model ZXB, a 4-cylinder unit. It is equipped with all accessories and the controls are located at the front of the engine which is on the right side of the diesel looking at the flywheel end.

The gasoline engine cranks the diesel by a pinion on the usual flywheel ring gear and drives the pinion by V belts. A clutch disengages the gasoline engine from the V-belt drive to facilitate starting the gas engine. The operation of this clutch is inter-connected with the shifting of the pinion into cranking position on the ring gear. After the gasoline engine is started, which may be done by either a starting motor or by hand cranking, the operating lever is moved to engage the clutch. The first movement of the lever engages the pinion on the ring gear and further motion engages the clutch and cranks the diesel. When the diesel has started the cranking pinion is automatically kicked out of mesh.

Biggest Road Show Ever

That the 1936 Road Show will be bigger and better than ever was evidenced by the fact that when the Exhibit Committee met on October 24 to allot space, they found that the number and size of applications were so great that it was necessary to provide an additional area for exhibit space.

The A.R.B.A. announces that manufacturers have more real developments and improvements in equipment than at any previous Road Show; the average amount of space per exhibitor exceeds the space used at previous shows; at least four pieces of equipment to be exhibited will weigh 20,000 pounds more than the heaviest piece ever exhibited; and an exceptionally large attendance is already assured.



The New Marlow Self-Priming Pump

New Self-Priming Pump With Air-Cooled Engine

A new 2-inch heavy-duty self-priming centrifugal pump on wheels and with an AGC rating of 10,000 gallons per hour has been announced by Marlow Pumps, Ridgewood, N. J. The pump is wholly automatic in its self-priming and is guaranteed to handle suction lifts up to 25 feet with a maximum total head of 70 feet.

The power is a 2½-hp air-cooled engine with independent magneto having an impulse coupling, speed changer, gasoline filter, and removable cylinder head. The complete unit weighs 290 pounds mounted on steel wheels.

New Heavy-Duty Excavator

A new digging unit, the 85-B, which is designed to meet the requirements of quarry and heavy-duty construction, has been announced by the Bucyrus-Erie Co., South Milwaukee, Wis. The base of the 85-B, which is a fully-convertible unit, is of all-welded construction, and is supported on two heavy cast side girders which form the frame for the crawler rollers and tumblers. The shovel carries a welded box girder boom with outside dipper handles. The special rock dipper is made of two strong steel castings riveted and keyed together. The front is of manganese steel. The shape allows rock to enter easily and the flare out toward the bottom insures free dumping.

Full Ward-Leonard direct-current field control, with separately excited shunt-wound motors, permits the operator to complete the entire digging cycle without the use of brakes or clutches. This feature, it is claimed, not only eliminates the constant adjustment and maintenance of mechanical brakes and clutches, but also gives the operator full control over the dipper at all times.

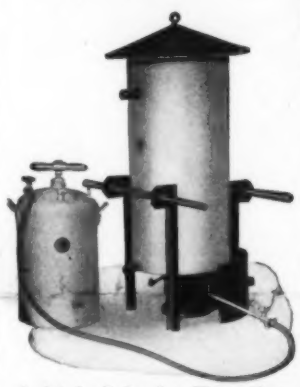
The 85-B, as a shovel, weighs approximately 224,000 pounds. As a dragline, it will handle a 3-yard heavy-duty bucket on a 65-foot boom. A catalog describing in detail the features of this new 85-B excavator may be secured direct from the Bucyrus-Erie Co.

Plows for Light Trucks

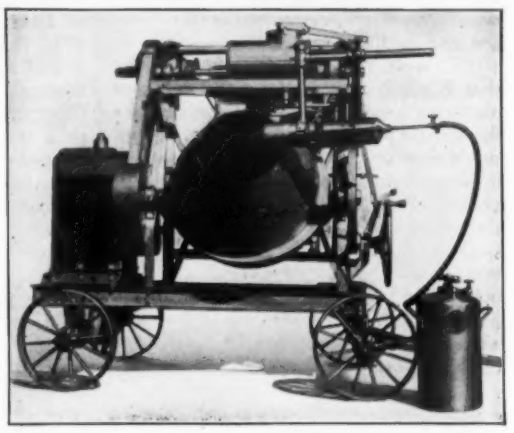
A new line of plows, built to match the power output of trucks in the Ford and Chevrolet class, has just been announced by The Austin-Western Road Machinery Co., Aurora, Ill. These plows are reported to be carefully designed and fabricated in order to secure better balance and greater strength, and are curved to handle a maximum volume of snow with a minimum expenditure of power. All excess power-consuming weight has been avoided to increase truck speed, to prevent injury to the front of the truck and to permit easy and quick attachment or removal as desired.

The three types of plows are the V-type, the reversible straight blade type, and a one-way tapered blade. The three plows can be used on the same frame and are interchangeable. Other features available on these plows include rubber tired, caster wheels, safety spring release, and means to adjust the pitch and plowing angle of the blades.

Prepare for Winter with Littleford Heating Equipment



Jacketed oil burning Water Heater that turns out a steady stream of hot water—ideal for outside construction jobs.



Littleford Concrete Heaters are made in styles and sizes for Mixers of all sizes and types.

You can carry on your various construction and maintenance projects with unabated energy if properly equipped with Littleford Heating Equipment.

Such outfits as Surface Heaters, Tool Heaters, Heating Torches, Concrete Heaters, Water Heaters and Salamanders enable you to have plenty of heat where you need it.

Write for complete information about Littleford Winter Heating Equipment. Let us tell you how and where to use it. You will be under no obligation.

THE SIGN OF A GOOD HEATER — LB — LITTLEFORD BROS. CINCINNATI, OHIO

LITTLEFORD

Road Maintenance Equipment

SINCE 1900

LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

MOVE MORE DIRT *FASTER!*

For lowest cost dirt moving, *use Continental Wagon Scrapers*, the modern *scoop-up* and *carry-away* units. Made in 5 and 7 yard sizes, they cut, scoop and carry, dump into fills, windrows or stock piles, against culverts, bridges or walls. Designed for maximum operating flexibility. No labor required—they operate from the tractor driver's seat. Fast—rugged—foolproof. Continental Wagon Scrapers speed up the job and greatly lower dirt moving costs! Send today for new descriptive bulletin.

Five 7-yd. Continental Wagon Scrapers operated by William L. Lathers, Jr., at West Salem, Wisc., for cut, fill and windrow work.

CONTINENTAL ROLL & STEEL FOUNDRY CO.

332 S. Michigan Ave., Chicago, Ill. Industrial Equipment Division General Offices: East Chicago, Ind.

Excavating Muck by Elevating Grader

RIPLEY may "Believe it or not" but Kadane Construction Co. of Frederick, Okla., did move muck from the bottom land on NRS 384 B & C projects in Creek County, Oklahoma, with an elevating grader and the proof may be found in the files of the Oklahoma Department of Highways. Northeastern, northwestern and central states contractors think of muck as something that is found in holes that are always wet and an expensive job to excavate. You may have heard also of dry weather, usually spelled "drought" in the western and southwestern states in 1934 and 1935. Well, that was the major reason that Kadane tackled the muck with an elevating grader. The job was successful until a rain did its stuff in replacing the water in the bottom of the muck hole or bottom land. Then what happened? Well, the crawler tractor pulled the elevating grader into the hole, but walked out without the grader. It took two of the Sixties to pull the grader out on its side to dry ground. Crawler treads and the usual effective steel wheels of elevating graders are two different breeds of animals when it comes to navigating soft ground.

This county NRS job started 5.5 miles from Bristow, Okla., and continued for nearly 10 miles through the old oil town of Slick in Creek County to the Okmulgee County Line where another contract was awarded to the same company for 2 miles of the road to the town of Beggs at the junction of U. S. 75 with the county road.

Some Rock Excavation

There was 35,000 yards of rock to be removed on Sections B and C. The contractor did not move in a complete pneumatic drilling outfit but tackled the soft sedimentary rock with a Bucyrus-Erie 32B, loading to six trucks hired locally from individual owners with the drivers. The haul ranged from 500 to 1,200 feet. A small amount of blasting was done in ditches with the explosive placed in hand drilled holes.

Earth Excavation

The 90,000 yards of earth excavation was handled entirely by an Adams 42-inch belt elevating grader with McCormick-Deering power for the belt. The unit was pulled by a Caterpillar Sixty. The dirt was hauled to the fills with Ford trucks as with the rock excavation, and with the same lengths of haul.

Another Caterpillar Sixty with an Adams 10-foot blade grader spread the earth on the 30-foot crown, 31 feet on curves, and cut the ditches where possible. Ten fresnos handled by local teams from Creek County did the heavy work in the ditches. The fills were laid down in 1-foot lifts and after the grade was practically complete it was brought to exact elevation by fresnos with 3 or 4 mules. The contractor used 3 and 4-foot fresnos for the ditches and the final grade work.

Kadane Construction Co. Completed 9.84-Mile Grade and Drainage Job in Oklahoma

Gravel Surface Course

The gravel top course which made an excellent surface when spread uniformly was hauled by the contractor with 3 and 4-yard tail and center-dump trucks from a gravel pit 14 miles south of Bristow, giving an average haul of 17½ miles. The contractor bought the gravel rights of the pit and used rotary fresnos of 2½-yard capacity behind Caterpillar Sixties to pull the material to a trap covered with a grizzly. The hopper fed a 27-foot belt carrying the material to a shaker screen with a double deck, the top ¾-inch and the lower deck ¼-inch. The material was stored in two 14-yard bins for quick loading to the hauling trucks.

The gravel was spread from center piles by the Adams grader. The trucks dumped their loads in the center of the road and the spreading was not done until the grader was ready to spread a considerable section completely. Even then the gravel was not carried to the extreme edge until the final shaping was to be completed. This was done to prevent the traffic, which used the road continuously, from throwing the gravel onto the shoulder.

C. & E. M. Photo

Bucy Boase, Superintendent for Kadane (Left) and J. K. Turner, Inspector for the State Highway Department

The gravel specifications call for 60 per cent passing a ¼-inch screen and 40 per cent retained on the ¼-inch screen with ¾-inch material maximum size. The material may contain as high as 25 per cent clay as a binder. It was placed on the road 11 cubic yards to the station 3 inches thick at the center and feathered to zero thickness 10 feet either side of the center line.

Bridges and Culverts

There were four bridges built to standard Oklahoma specifications of I beams and concrete slab, over 20-foot span, and thirty culverts of concrete ranging from 3 x 2 feet to 10 x 10 feet in section and from 32 to 47 feet in length.

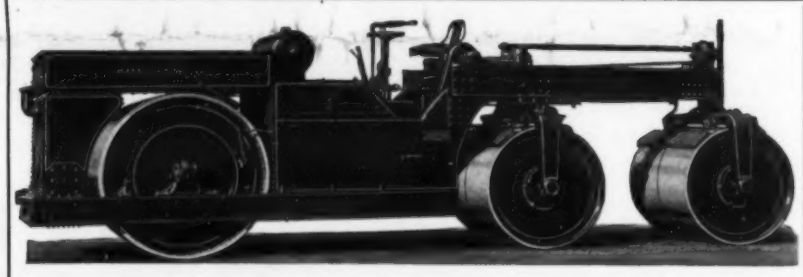
Labor Hours

The job was operated on an 8-hour day under Oklahoma State law with a 30-hour week. At the gravel pit there were two 5-hour shifts a day. These two shifts produced from 125 to 160 cubic yards a day.

Personnel

The contract for this work was awarded April 15, 1934, the work started May 3, 1934, and graveling was completed at the end of April, 1935. Bucy Boase was Superintendent for the Kadane Construction Co., and Charles Breeden, Resident Engineer and J. K. Turner, Inspector for the State Highway Department of Oklahoma.

The pouring of the first concrete for the great Coulee Dam, destined to be the largest structure built by man, will take place in November or early December, attended by appropriate ceremonies.



The New Buffalo-Springfield Three-Axle Rollers for all kinds of precision rolling especially of bituminous materials either hot or cold.

This new type of Roller (Patented) introduces the new principle of automatic compression and leveling, and retains the advantages of large diameter in all rolls. The entire roller is steerable with all rolls in permanent contact with the surface material thereby giving multiple compaction at all times.

An illustrated pamphlet is available and will be sent upon request.

THE BUFFALO-SPRINGFIELD ROLLER COMPANY
Springfield, Ohio

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Here is the equipment you need NOW for your Dual-Tired Trucks, Tractors, Motor Graders, Etc.

J & S TRACTION TREADS will put every ounce of engine power into your tractor wheels in mud, sand, or snow and ice.

Easily attached with positive adjustable lock which compensates for tire wear and tire variation.

Shoes are made of special wear-resisting, heat-treated steel. Pins and connecting links are special alloy steel and hardened.

J & S TRACTION TREADS do not injure tires but protect them. Made to fit all sizes of Dual Pneumatic Tires. Write for prices, addressing your inquiry to Department C.

W. A. RIDDELL COMPANY
BUCYRUS, OHIO

Low Cost
DIESEL-GENERATED POWER FOR EVERY CONSTRUCTION NEED

F-M Model "36" Diesel engine and generator set—light, portable, powerful, efficient

- Electric power for tools and for every construction need—*where* you want it, *when* you want it—that's what the F-M Model "36" Diesel engine-generator unit offers every contractor.

No matter where the job may be—far beneath a city street or along a levee miles from established power facilities—you can now generate *your own* current for tools, lighting and a hundred other purposes, at a fraction of the cost. Light in weight, readily portable, this simple fool-proof power unit burns low cost fuels with complete Diesel efficiency, furnishing power as you need it without fussing or attention.

F-M Model "36" Diesels perform a wide variety of jobs for builders and contractors. Units for direct drives on earth-handling machinery, pumps and compressors in capacities from 10- to 160-hp. For full information address Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 32 branches at your service throughout the United States.

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DIESEL ENGINES

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Progress in Road Work on Dark Continent

(Continued from page 1)

These reductions are accounted for, in most instances, by reclassification as trails of routes previously reported as roads.

Italy's Program

In Italian Somaliland, it is said, the Italian Government's object is to motorize transportation to the fullest extent. The nature of the country permits the realization of this plan at a minimum expense and the increase of 1,481 miles during the last three years is evidence of the rapid improvement in the road system. The semi-arid character of the terrain requires but the simplest type of construction with but little grading or surfacing. There are 18 miles of concrete road out of the port of Mogadiscio and 25 miles of branch lines surfaced with other materials. All the rest of the mileage is of the dirt-type with no artificial bed.

A progressive plan of highway development has been under way in Tripolitania, one of the two Italian provinces of Libya, which has advanced much farther in highway development than the neighboring province of Cirenaica. The City of Tripoli is fairly well supplied with roads, many of which are surfaced, connecting important centers in outlying districts. The efforts of the Italian Government has been concentrated on the construction of highways which can be used alike for commercial and pacification purposes. By the use of paved roads and caravan routes it is possible to travel even to the most distant sections of the colony. The question of highway construction is considered of greater importance than practically any other problem now encountered in the administration of Libya. During the last four years more than 400 miles of roads in Tripolitania have been asphalted.

On the other hand, the development of roads in Cirenaica has not been on such a large scale as complete pacification was not effected until 1931. A road of rock base and asphalt surface to the Egyptian border has recently been completed. Italy is concentrating on an intensive colonization of Cirenaica and its highway program is of the utmost importance in this development.

And Ethiopia's

Highway construction in Ethiopia is performed by concession only, under control of the Emperor. All planning and financing of roads is done by the Government, funds for which are taken from general revenues. No annual budget for road development exists, but it is estimated that a total of $1,000,000 (U. S.) has been expended in the construction of such roads as there are.

The development of roads in Ethiopia has progressed very slowly. Although the Emperor himself has manifested considerable interest in the extension of highways, and all the road building equipment in use in Ethiopia, consisting of five rollers, three tractors, three graders and two crushers, belong to the Government, lack of funds and high cost of motor transport have retarded any material progress.

With an area of approximately 400,000 square miles, Ethiopia has less than 1,000 miles of roads, of which about 600 are unimproved earth and unsurfaced and passable only during the dry season. The country, of course, is crisscrossed by caravan routes, but these can be used only by mules and camels.

There are two dry-weather improved earth roads. One, from Addis Ababa to Bale, is approximately 200 miles long; the other, from the capital to Jimma, about 125 miles. Following the rainy season, both of these roads must be almost entirely relaid. A third dry-weather road which would lead from Addis Ababa to Lekempte, branching there to Sayo and Belfodio, a distance of approximately 600 miles, was projected but no preliminary surveys were made. Now, of course, the Ethiopian Government has other problems on their hands, and are concerned mainly with increasing the difficulties for the invaders rather than lessening them.

The only surface-treated roads in Ethiopia are in Addis Ababa, where there are about 10 miles of asphalt macadam streets.

(Continued on page 25)

Bureau of Foreign and Domestic Commerce Photo

Long Distances and Mountainous Terrain Are Two of the Problems of Road Building and Maintenance in the Union of South Africa. This View is Typical of That Section.

Get CLEAN SAND and GRAVEL with EAGLE WASHERS

Screw and Paddle type machines to meet particular washing and cleaning problems in sizes to suit capacity requirements. Send for bulletin W2 for complete information.

EAGLE IRON WORKS
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Standard Asphalt Road Oils
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Standard Refined Asphalt for sheet asphalt paving
Standard Cold Patch Asphalt for all types of patching
Standard Asphalt Binders B & C for penetration work (Asphalt Macadam)
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Standard Asphalt Emulsion for Surface Treatment, Penetration, Road and Plant Mix, and Patching

Specifications and all other particulars furnished on request.

SOCONY-VACUUM OIL CO.
INCORPORATED
STANDARD OIL OF NEW YORK DIVISION

Two Batchers Set Pace for Snappy Concreting

Russ Mitchell, Inc., Laid 1,500 Feet of 18-Ft. Slab Daily on 11½-Mile Project in Brazoria County, Texas

WITH "Red" Williams at the helm, the paving crew of Russ Mitchell, Inc., Houston, Texas, sewed up 11½ miles of paving on Project NRS 778A in Brazoria County, Texas, last spring. Speed was the word in spite of poor subgrade which had to be corrected and the almost constant dust storms. Dual batchers with plenty of space along the spur track made that end of the work run smoothly. Then several well-thought-out devices made the work cleaner and easier.

The Batching

Sand and gravel were brought in by rail and unloaded with a Koehring crane and 1-yard Erie clamshell bucket. As the specifications required 24-hour stockpiling the contractor elected to set up a second batching plant so that one would be ready each day. The night shift unloaded the aggregates to the stockpiles. With a long pile of sand in the center of the batching area and a Butler and a Blaw-Knox batching plant the gravel was placed at the outside of the group. The crane ran between the stockpiles and the track with plenty of room for easy operation.

The labor organization consisted of the small night crew for unloading and the day crane men, a batch man, and the two men at the cement platform. The batches consisted of 1,428 pounds of sand, 2,588 pounds of gravel, both loose dry weight, and 6 sacks of cement. The cement platform was located about 300 feet from the nearest batching plant on a separate spur. Two men there stacked 6 bags of Long Horn cement onto each of the hand trucks and when a batch truck hesitated in front of the platform, the bags were tipped off onto the aggregate. The single batch trucks were all equipped with hydraulic dumps and dual pneumatic tires. There were from six to thirty batch trucks in use each day, depending on the length of haul.

Water-Treated Subgrade

Two or three fresnos with mule teams were required to smooth up the rough grade ahead of the Carr Formgrader which cut the trenches in the heavy sticky clay. This machine was altered slightly because the wheels sank into the subgrade when it was wet down according to specification with from 4,000 to 10,000 gallons of water per station. This treatment permitted better compaction with the roller but bogged the Formgrader. To overcome this the outer wheel was removed and the crawler of an old Fordson tractor, driven by a heavy chain, was substituted. This gave the machine better traction under these conditions.

Mechanical Subgrader

The two lines of Metaforms for the 18-foot, 9-6-9-inch slab were set after the trench had been cleaned out by hand. There were eight men on this work and two men and the foreman on lining up. A Flynn Surgrader (pronounced sure grader), made by the Flynn Mfg. Co., Alexandria, La., ran on the forms and cut the grade true to crown and elevation, picking up the excess dirt and casting it outside. It was operated by a 6-cylinder Waukesha engine. The stickiness of the gumbo slowed up the subgrader at times, permitting the paving crew to come dangerously near the new grade.

C. & E. M. Photo

"Red" Williams, Superintendent for Russ Mitchell, Inc.

Final Grade and Steel Setting

A rolling bridge behind the grader carried all the steel and the header boards for the expansion joints. The header boards were hollow, of steel plates welded together and with short rods at the top of the slots where the dowels went through the header. Four

(Continued on page 18)

PILE HAMMERS
and
EXTRACTORS
HOISTS – DERRICKS
WHIRLERS

Special Equipment
Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York
Distributors in Principal Cities

STEEL BEARING PILES
ARE NOT NEW

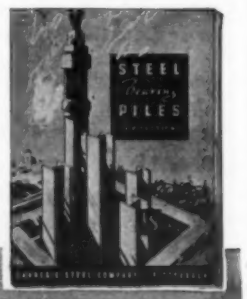
VARIOUS steel sections have been used for bearing piles for more than 40 years. The introduction of H-sections, 25 years ago, gave considerable impetus to the use of steel for this purpose. As improved sections have been made available, the use of steel piles has rapidly expanded. Examination of the steel piles of hundreds of bridges in the middle west, in service from 25 to 38 years and still in excellent condition, discloses this important fact—that loss of metal from corrosion is a negligible factor, too slight to be of any consequence.

CBP SECTIONS ARE NEW

The popularity of sturdy, wide-flange CB Sections for bearing pile use led to the design of special sections, particularly adapted to the purpose. These are known as CBP Sections and are recommended for any and all purposes for which any type of bearing pile may be used.

The great capacity per pile, the ease and speed of driving, the fact that steel piles can be driven with minimum displacement or disruption of the soil, thus reducing the possibility of disturbance to adjacent structures . . . these and many more advantages commend steel piles to those concerned with bridge and building foundations, trench and sewer construction, grade crossing elimination work, and a host of other applications.

A NEW BOOK on the SUBJECT



An 80-page book "Steel Bearing Piles" presents an extensive review of the use of steel piles in the past, as well as data and illustrations of current practice in the design and use of CBP Sections. We shall be pleased to send you a copy.

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PITTSBURGH • PENNSYLVANIA
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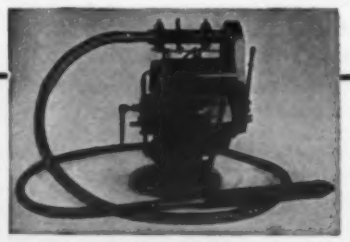

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AND GRINDERS
Write for Circular on types, sizes and prices
White Mfg. Co.
ELKHART, INDIANA

Changes in Sales Staff at Caterpillar

Caterpillar Tractor Co., of Peoria, Ill., has announced the promotion of Paul Weeks, for the past four years Manager of the Washington office, to the position of Manager of the Special Sales Division to succeed Walter H. Gardner, who left the company on October 1 to become General Sales Manager of Keystone Steel & Wire Co. Assisting Mr. Weeks will be C. L. McMullen, in charge of engine sales to manufacturers, and G. E. Spain in charge of power unit sales to distributors and engine dealers.

Mr. Weeks has been associated with the Caterpiller Co. since 1910, having served as chief engineer, general service manager and Washington manager. Mr. McMullen has spent his entire career in the engine business, joining the Caterpillar Special Sales Division when it was organized in 1931. Mr. Spain, who was formerly Sales Manager for Willamette Iron & Steel Works, of Portland, Ore., joined the sales department in 1929 and since that time has been connected with the equipment research and special sales divisions.

Guiding the Motorist To Safety on the Road

There is of late a strong and powerful demand on the part of the general public to decrease the number of automobile accidents and the terrific and unnecessary loss of life as a result of these accidents. State highway departments have consistently attempted to meet the public demand not only for better roads, but also safer roads.

Dangerous curves, culverts, ditches and embankments should be properly marked. To meet the requirements of such conditions, the Truscon Steel Co., Youngstown, Ohio, has developed a signal traffic guide for use where guard rail is not essential but berm conditions require some warning. This adjustable Berm-A-Lite is visible at 500 feet in the glare of a car's headlights and if placed at 100-foot intervals, gives positive warning to motorists. These lights can be removed to other locations as guard rail is erected, giving economical protection and 100 per cent salvage.

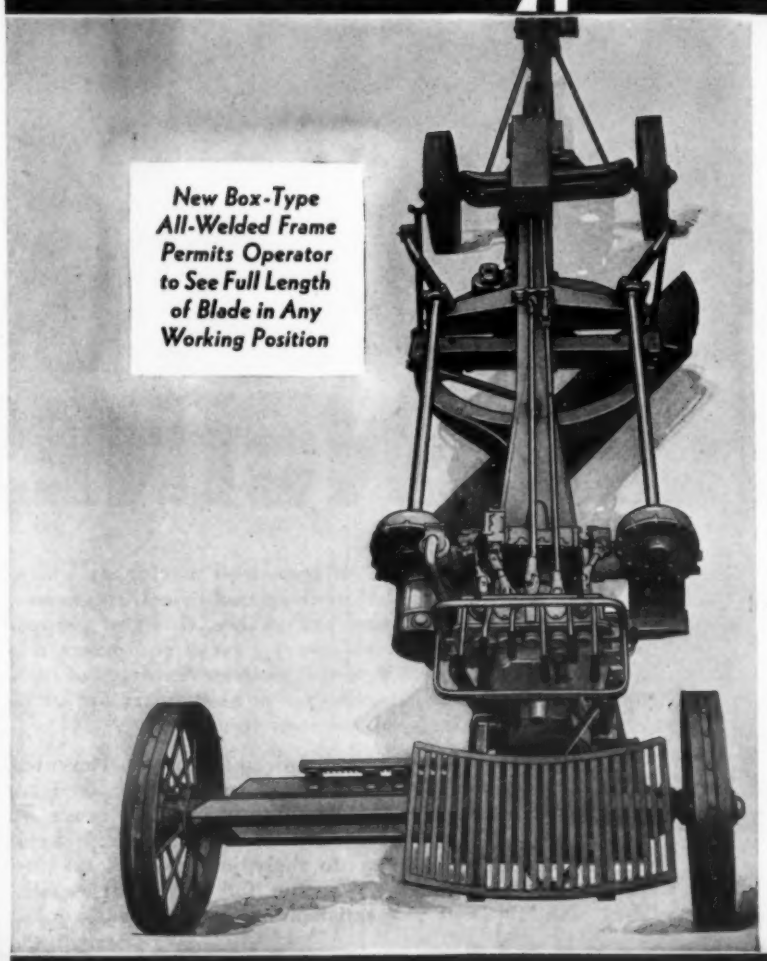
Literature describing Berm-A-Lite may be secured by state and county highway engineers direct from the Truscon Steel Co.

NEVER BEFORE SUCH

COMPLETE VISIBILITY

IN ANY ROAD GRADER

–the New-Type ADAMS GRADERS



New Box-Type All-Welded Frame Permits Operator to See Full Length of Blade in Any Working Position

THE blade is the "business" end of any road grader and it is important that the operator be able to see as much of his blade as possible so that he can see what he is doing. This is particularly true on work where fine adjustments are necessary.

On other graders the operator's vision of the blade is seriously impaired by a maze of frame beams, cross-bracing, lateral shift adjustments, lift springs and other obstructions. The simplicity of Adams design, as illustrated at the left, gives the operator a full view of the blade in any position—an important advantage as any operator will tell you.

Complete visibility is but one of the outstanding features of the new-type Adams Graders—the new, box-type all-welded frame is unequaled for strength and rigidity and it permits an extremely wide range of blade positions without making time-consuming adjustments of lift links, lateral shift mechanisms and moldboard. Adams power-operated controls raise the blade from ditching position to high bank-cutting position in 40 seconds—other adjustments are correspondingly fast.

These new machines are now available in 12-ft. and 10-ft. blade lengths, with power-operated or hand-operated controls. Before buying any grader let our local representative demonstrate one of these remarkable machines.

J. D. ADAMS COMPANY, Indianapolis, Indiana

Branches, Representatives and Distributors Throughout the United States

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

When a Verbal Agreement Is Enforceable

"When I said that work *could be done* for $1,345, I did not mean to bind myself to do it for that," said a subcontractor when sued on the ground of breach of contract. "That was merely mentioned informally as the probable cost. It was intended that a careful estimate should be made later and a subcontract reduced to writing and signed."

"Oh, yes?" replied the general contractor.

In the case of Reimann Construction Co. v. Heinz, 137 So. 355, the Louisiana Court of Appeal upheld judgment in favor of the general contractor, on a theory that the evidence showed a binding verbal agreement. Said the court:

"It is true, of course, that if parties, in contemplation of making a written contract, agree on some of the terms thereof, but intend later to settle other remaining points and then to execute a written evidence of their agreement or if parties, having agreed verbally on all points, further agree that no contract shall result until the total understanding is reduced to writing and signed, then the verbal agreements are not binding upon either, since it is the intention of both that the document to be later executed shall evidence the whole contract. . . .

"But it is also well settled that, if all terms and conditions are agreed to and it is later suggested that the agreement be reduced to writing so that the contract will be less mutable and more easily proven, then the verbal contract is entirely binding, even though the written contract may not be later executed."

When Is a Job "Completed"?

"One furnishing materials to public works contractor may hold the contractor's bondsman liable for the unpaid price, provided suit be brought on the bond within six months from the *completion* of the job," in effect declares the laws of Kansas.

A sewer contract called for a plaster coat on a flush tank to make the tank water-tight. The coat had not been applied when the job was inspected and accepted by the city, but it was applied within a few weeks later.

The Kansas Supreme Court decided (W. S. Dickey Clay Mfg. Co. v. Snyder, 23 Pac. 2d, 592) that the job was not completed until the plaster coat had been applied, and that suit brought on the bond within six months thereafter was timely.

Quoting from one of its earlier decisions, in a case where highway guard rails remained unpainted, the court noted that:

"Regardless of the amount of work to be done, the matter is determined by the fact of whether the unfinished work was a part of the original contract, necessary to be done to complete the job and comply with the requirements of that contract."

When Payment Is Not Payment

"Mr. Insurance Company, we want to cancel the workmen's insurance policy you are carrying for us," said a New York employer. "Please rebate the unearned premium."

"Why, we never received any premium from you," replied the insurance company. "We want your check for premium accruing up to cancellation."

"We paid Bloom, your agent, and if he did not pay it over to you that's your lookout, not ours," came back the employer.

"But," replied the insurance company, "you did not pay him cash or give him a check payable to our order. Instead you gave him check payable to him for part of the premium and gave him notes, payable to him, for the balance. We never authorized any such settlement."

The controversy went to the New York Supreme Court for New York County, where it was decided in favor of the insurance company. Let every contractor who has dealings with insurance agents remember what the court said:

"Bloom was the agent of the defendant [insurance company] for the purpose of delivering the policy and the collection of the premium. However, the evidence does not show that Bloom had any authority to enter into any arrangement personally to extend credit, defer the time of payment, and take the notes of the insured payable to Bloom . . . in satisfaction of the premium. His authority did not extend further than upon delivery of the policy to receive from the assured the amount of the premium named therein, . . . in a form which in and of itself would be payable to the company." (257 N. Y. Supp. 144.)

Contractor's Departure from Specifications Proved Costly

An Oregon contractor must have found it very costly to omit compliance with numerous specifications of a building contract. He spent more than $3,000 more for labor and materials than he received payment for. On top of that he lost his 15 per cent commission for services. And on top of that he was stuck for an affirmative judgment for $2,500.

This judgment was based upon a finding by a jury that he willfully substituted inferior materials for those called for by the specifications and in some respects did not cause the job to be done in a workmanlike manner. In upholding the judgment, the Oregon Supreme Court said (Turner v. Jackson, 11 Pac. 2d, 1048):

"It will be observed * * * that the plaintiff breached his contract in more than a score of particulars. Many of the breaches are of a very serious character, as in the substitution of inferior lumber for the kind required by the specifications, and can not be remedied."

TENTS
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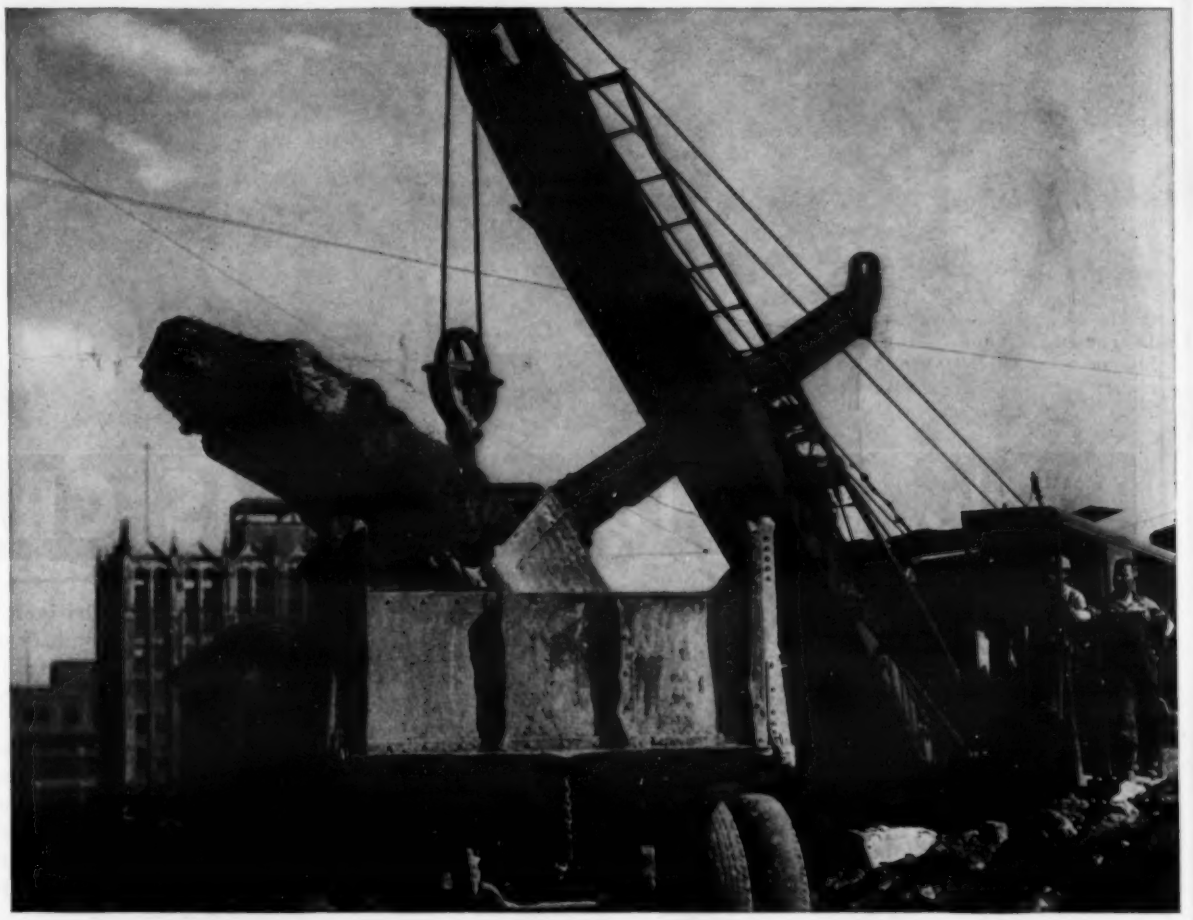
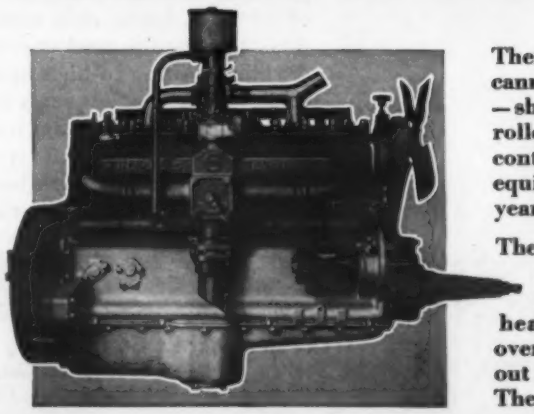
WINDBREAKS
The Fulton line is sold through Contractor Supply Dealers in every state. A quality line priced right. Ask for SHUREDRY and FULTEX Tarpaulins, Tents, Windbreaks.
Write our nearest plant today for catalog, samples and price list.
Fulton Bag & Cotton Mills



HERCULES ENGINES



There is no type or kind of industrial machinery which cannot be had with either Hercules gasoline or Diesel power—shovels, mixers, compressors, cranes, dredges, pumps, rollers, trucks and tractors—every type of equipment the contractor or road builder requires. Manufacturers of such equipment have used Hercules power as standard for many years—buy more Hercules engines every year.

The reason why over four hundred thousand Hercules Engines have been built and sold is not hard to find. Hercules designs and builds a wide range of heavy-duty engine sizes—all recognized the world over as *dependable*. They do their job day in and day out with a minimum of time out for service or repair. They stand up and give satisfaction on the hardest jobs.

HERCULES MOTORS CORPORATION • CANTON, OHIO

America's Foremost Engine Manufacturer • Power Plants from 4 to 200 H. P.

PORTABILITY

A COMPLETE LINE ½ YD. 3 IN ONE ZYD. OL

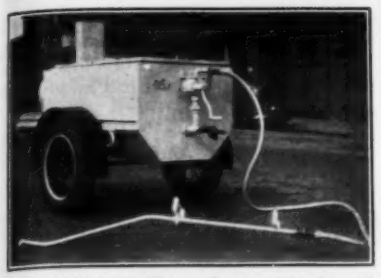
The ½ Yard AMERICAN GOPHER SHOVEL » CRANE DRAGLINE » can be easily loaded on a trailer and trucked to the job.

It meets all weight requirements and road clearances.

When job is finished, just reload and truck to new job.

Here's real portability and economy of operation.

AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL MINNESOTA



The Littleford Motor-Spray Attachment

Motor-Spray Attachment for Asphalt Kettles

A new motorized attachment which converts any make or size of tar or asphalt kettle into a complete maintenance unit has been announced by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio. The cover lifts easily and automatically locks in place. In order to close the cover, the long spray hose must be detached. This is done purposely so that laborers using the outfit will remove the hose and drain it to eliminate the danger of overnight clogging.

A short flexible metal insulated hose connects the draw-off and the pump suction and can be easily attached and quickly drained. A three-way valve is arranged so that the motor-spray unit will pump material from a storage tank into any other receptacle. It can by-pass the material and act as a separate pumping unit, and can also pump material from small commercial drums or from storage tanks, filling the kettle through the pumping unit.

The pumping mechanism is located inside of a metal box. Heat from the gasoline engine is exhausted into this box or hood to keep the pump warm and there is a relief valve in the pump head. The engine, pump and entire assembly are completely enclosed, theftproof and waterproof when the cover is down. A crank starter replaces the old rope starter. The engine is large enough to take care of two sprays with ⅛-inch nozzles. It drives the pump through an enclosed gear reduction running in oil. A Twin Disc clutch and oil-type air cleaner add to the dependability of the motor-spray unit.

It is estimated that the burden of property loss and cost of traffic accidents last year exceeded $2,500,000.

Snow Removal Equipment Has Safety Features

An improved line of snow removal trucks for the winter of 1935-36 has recently been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. Although many new improvements have been made in the various models to increase their safety and dependability, one of the primary measures is that to prevent the presence of carbon monoxide gas in the cabs of the trucks during operation.

Three steps have been taken to insure against the menace of carbon monoxide gas; tight exhaust lines through the use of a three-piece manifold with expansion joints between the middle and two end sections; a thorough check and adjustment of the ignition and carburetion systems of each truck to attain proper combustion efficiency of the motor; gas tight cabs, thoroughly tested with a carbon monoxide detector.

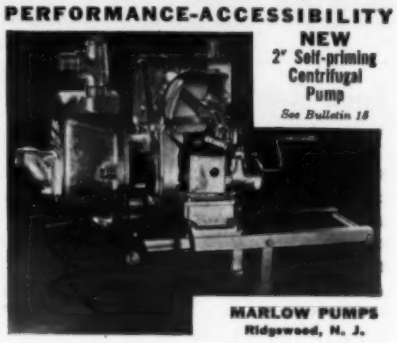
The frames of several models have been strengthened to increase their capacity for standing the thrust of bucking heavy snow. Drop frames of 7⅞-inch width have been adopted as standard equipment on the HS series 1½-ton trucks. The H6, HH6 and the Maintainer series now have 7-inch frames, about 25 per cent stronger than those formerly used.

The Utility series in the 3½ to 5-ton range has also been improved. The front axle ball and socket and the front axle shaft cage ring have been increased in size. Axle ring gears are now fastened to the differential housing by twice the number of bolts, thus increasing the strength of the assembly. Other improvements include: four-wheel booster-operated hydraulic brakes; larger propeller shaft joints; thermostatic water flow controls; and new square-type rear axle housings which makes its possible to use the same rear axle assembly for both single and dual tires.

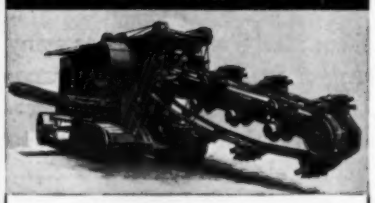
The M series now includes the M-10 10-ton truck as a standard model. The M-10, largest four-wheel truck in the FWD line, has a 198-hp motor, oversize transmission and axle shafts which make this unit particularly adaptable for the heaviest kinds of snow removal work.

At the present rate of progress it will take until long after the year 2,000 before even the extremely dangerous grade crossings are made safe.

PERFORMANCE-ACCESSIBILITY



"RARIN' TO GO!"
For Ditching Profits



Used Trencher fully covered with factory guarantee

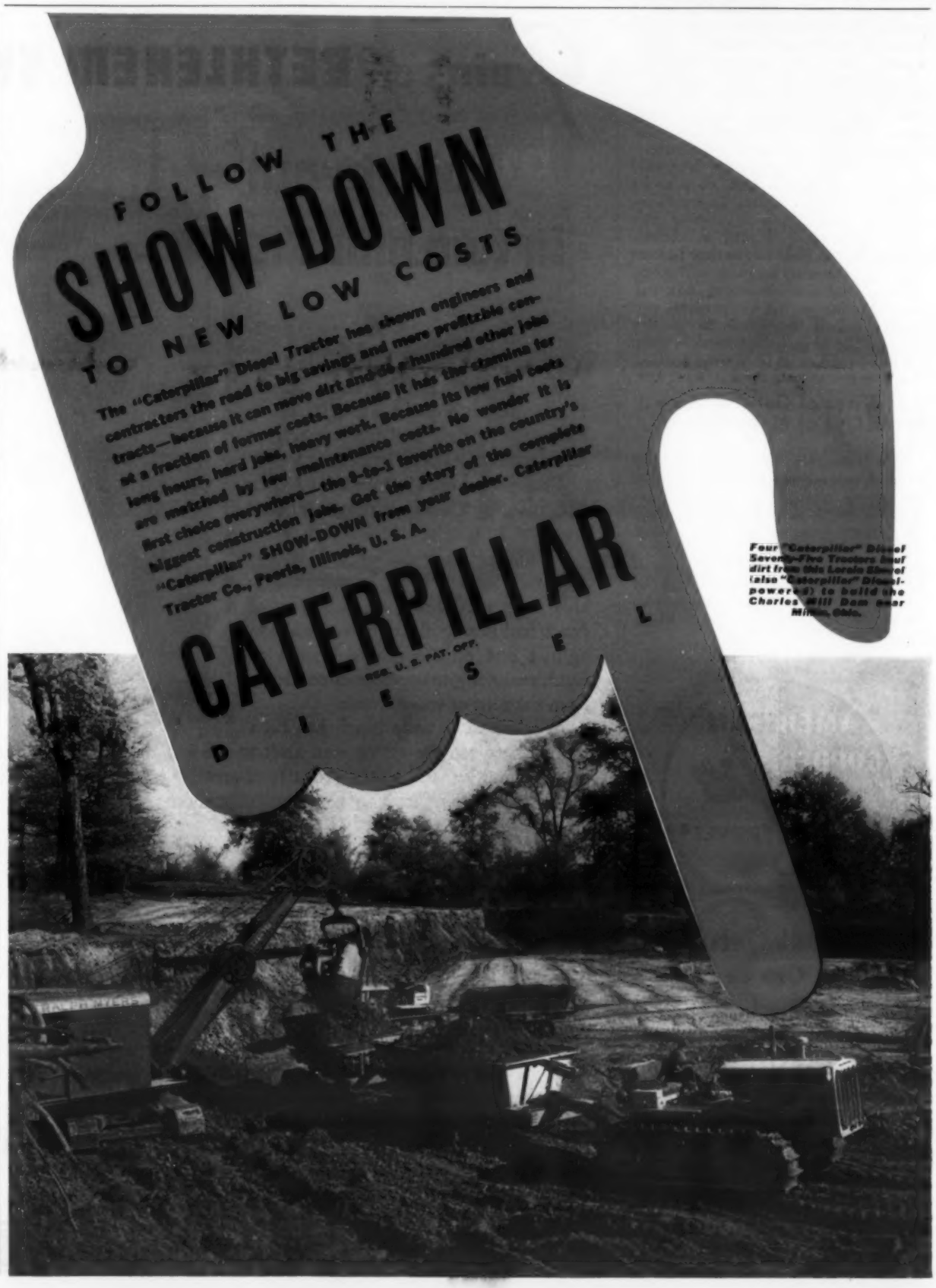
It's like new, this late model P&H Trenching machine! It's a Model 15-36, Ladder Type, built for big production. It will earn real profits on smaller jobs, too.

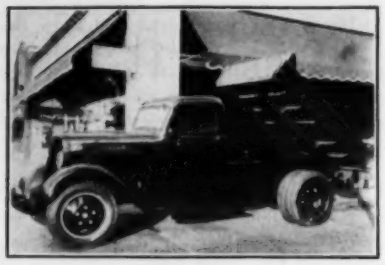
Advanced features include single cast steel frame for main machinery; independent boom crowding device for greater flexibility; 3-speed transmission for bucket line; 3-speed road traction; spoil conveyor power-operated for instant adjustment to any angle — can also be shifted to either side. It's equipped with the P&H "Sure Feel" power clutch that protects main machinery from disabling jolts.

Offered at a substantial discount, this machine is one of the outstanding bargains of the year. For complete details, write or wire:

HARNISCHFEGER CORPORATION
4419 W. National Ave. Milwaukee, Wis.

P&H TRENCHING MACHINES


FOLLOW THE
SHOW-DOWN
TO NEW LOW COSTS
The "Caterpillar" Diesel Tractor has shown engineers and contractors the road to big savings and more profitable contracts—because it can move dirt and do a hundred other jobs at a fraction of former costs. Because it has the stamina for long hours, hard jobs, heavy work. Because its low fuel costs are matched by low maintenance costs. No wonder it is first choice everywhere—the 9-to-1 favorite on the country's biggest construction jobs. Get the story of the complete "Caterpillar" SHOW-DOWN from your dealer. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.
CATERPILLAR
REG. U. S. PAT. OFF.
DIESEL
Four "Caterpillar" Diesel Seventy-Five Tractors haul dirt from this Lorain Steel (also "Caterpillar" Diesel-powered) to build the Charles Mill Dam near Mifflin, Ohio.



This Special Dump Body, Mounted on a Dodge Bros. Chassis, Is One of Several Similar Units Used by a Birmingham, Ala., Contractor

Snow Removal and Sanding

Snow removal and the sanding of slippery places on highways is of an emergency nature which cannot be definitely planned but which a state or county organization must be ready to handle on a moment's notice.

Snow falls occur at any time of day or night and vary considerably in intensity. It is not wise to wait until there is enough snow to start plowing before getting the plows attached to the equipment. All trucks and tractors in Wayne County, Mich., are equipped with snow plow frames in the fall, to which the blades can be attached on short notice. At the first indication of a snow storm these blades are attached and operations started as soon as necessary.

Slipperiness on a highway is caused by the compacting of light snow under traffic or by a sleet storm. Intersections, hills and curves must be covered with an abrasive material such as cinders, sand or fine slag as soon as they become slippery, or serious accidents will occur. The material used is treated with calcium chloride so that the particles will readily embed themselves in the icy surface. The necessity for speed in starting this work cannot be overemphasized.

Ten Ways of Getting More Work Out of Motor Trucks

This is the title of a 16-page booklet on truck management recently issued by the Service Recorder Co. It contains graphic charts and discusses routing, scheduling, how to check speeding, overtime and costly delays, and how to get that extra trip per day. Copies of this booklet may be secured gratis by readers of this magazine direct from the Service Recorder Co., Hanna Bldg., Cleveland, Ohio.

AMERICAN GOPHER SHOVELS SINCE 1905

as Shovels
as Cranes
as Draglines

the "ALL AMERICAN LINE" is an unbeatable combination of seven, not eleven, as follows:

½ ¾ 1 1¼ 1½ 1¾ Yd. and 2 Yd. D. L.

AMERICAN HOIST & DERRICK COMPANY
ST. PAUL, MINNESOTA

New Diesel-Powered Ditcher

A new diesel-powered trench excavator, known as Model 48, has recently been announced by the Parsons Co., Newton, Iowa. This new unit is especially adapted to dig sewers and other deep trenches and has a capacity of 300 cubic feet per hour. The standard digging equipment is for 20-foot depth and 48-inch width, but attachments enable it to dig both wider and deeper. The machine is semi-crawler mounted, and the drive sprocket shaft is fitted with a differential gear permitting the outfit to steer readily under working or traveling conditions. The conveyor is of the reversible type and can load either side. Twelve digging speeds are provided, through simple sprocket changes.

Power is furnished by a 102-hp 6-cylinder Caterpillar diesel engine, and the unit is also available with four-cylinder diesel engines of the same make.

Complete information on this unit may be secured from Parsons Co.

Changes in Link-Belt Staff

Announcement has been made by the Link-Belt Co., of Philadelphia, that T. Frank Webster of the Link-Belt Philadelphia office has been appointed Resident Manager of the company's Boston office, succeeding Horace Goldstein, who has been assigned to engineering sales work at the Philadelphia office. Mr. Goldstein is well known in Philadelphia territory and was formerly attached to the company's New York office. Mr. Webster was formerly in Pittsburgh.

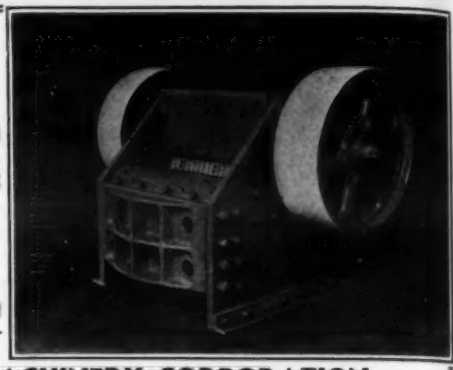
Good Roads MACHINERY

"GOOD ROADS" CHAMPION
COMPLETELY PORTABLE ROCK CRUSHING and SCREENING PLANTS

"Efficient in production—low maintenance cost."

The "Two in One"
"GOOD ROADS" ROLLER-BEARING CRUSHER
REDUCING TO FINES IN ONE OPERATION

Complete plant machinery for Quarries—Sand and Gravel Pits



GOOD ROADS MACHINERY CORPORATION
KENNETT SQUARE PENNSYLVANIA

Groins of BETHLEHEM SHEET PILING

build beach in two months

Detail of northern groin, showing beach eight feet higher at left

WITHIN less than sixty days, installation of two Bethlehem Steel Sheet Piling groins brought about a transformation in this seashore property at Loch Arbour, Asbury Park, N. J.

The groins were installed in December, 1934, by George Wooley and Son, contractors, for the Har Jones Corporation. The photographs were taken less than two months later. In this remarkably short period of time, eight feet of beach had been built up by wave action against one of the groins, shown at right, removing an ocean-front residence from the zone of wave attack.

In addition, a wide beach has been formed between the groins—an asset to the seaside community, and to the property it protects.

For installations such as this, involving shore protection, Bethlehem Steel Sheet Piling has many advantages. It forms a wall with strong, sand-tight interlocks between the individual pieces. It can be driven or jetted readily to depths attainable with other materials only with difficulty and at greater cost. It provides the strongest material available for the building of shore-protection structures.

To any problem involving the retention of earth or water, Bethlehem Steel Sheet Piling provides the simple, economical solution.

Left—An inviting sandy beach is being built by wave action between the groins

KALMAN STEEL CORPORATION
Subsidiary of Bethlehem Steel Corporation
GENERAL OFFICES: BETHLEHEM, PA.

District Offices: Albany, Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Cincinnati, Detroit, Houston, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Syracuse, Washington. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Salt Lake City, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

Lubrication Queries

Is some lubrication problem bothering you? Tell us about it and we shall be glad to help you.

Question

Our greatest trouble in lubrication is with heavy-duty sleeve-type crusher bearings. What is the proper lubricant to use? We also have trouble with ball bearings where the crusher shaft speed is from 180 to 200 rpm. There does not seem to be enough heat to melt the lubricant, resulting in the grease film giving way and the bearing being pulled out.—Clarksburg, W. Va.

Answer

Sleeve-type bearings on heavy-duty crushers run hot and require a sodium-base grease which has a high melting point. A grease not heavier than No. 3 should be used. If a No. 5 grease is used, it would be necessary for the bearing to generate enough heat to bring the consistency of the No. 5 grease down to that of a No. 3. Perhaps you are using a lime soap or calcium-base grease which requires a heavier body to meet the higher temperature generated. A No. 3 calcium-base grease has a melting point of 190 to 200 degrees F. and if used as 230 degrees the grease will run out. A No. 3 sodium-base has a melting point of 375 to 380 degrees. You should use the grease that will lubricate at the temperature at which your bearing operates without the need of additional heat to change the body or consistency of the grease.

Question

We use the lubricants recommended for our anti-friction bearings and pump it in with a grease gun. The grease melts and runs out, necessitating repeated lubrication with the gun. How can we overcome this?—Milwaukee, Wis.

Answer

It is a fact that most users of equipment with anti-friction bearings insist on over-lubricating these bearings, just as you have suggested in your question. This is particularly troublesome where the bearings are operating at a high speed. As soon as the bearing is overloaded, it begins to heat. If it is left alone for a while, the surplus grease or lubricant will work its way out as you complain that it has done, but this is perfectly proper and satisfactory as sufficient lubricant will be retained in the bearing to lubricate it properly.

Unfortunately, many operators, like yourself, in spite of frequent warnings given in service manuals, will pump more grease into the bearings, believing that the heat is due to lack of lubricant instead of too much lubricant. The anti-friction bearing was chosen by the manufacturer of that machine for the service required and his instructions cover the frequency with which the bearing should be lubricated.

Conveyor Belt Repairs

A rubber covering in two forms, liquid and plastic, has been developed for a great variety of purposes by the Self-Vulcanizing Rubber Co., Inc., 605 West Washington Blvd., Chicago, Ill. The new liquid rubber is called Self-Vulc and has been improved by the development of a new priming compound which makes good results possible by the application of a single priming coat and both the priming and liquid rubber can be applied just like paint, either brushed on, sprayed, dipped on, or poured on. The plastic material is applied with a spatula or other flat tool and, like the liquid, requires only one prime or preliminary coat and vulcanizes itself cold when exposed to the air.

The application of this material to worn conveyor belts is of unusual interest to contractors. The application is quite simple and consists of cleaning the belt so that the primer can get a proper hold on the belt, then applying the primer after which Self-Vulc plastic is applied with a trowel. The plastic is preferable here because the desired thickness can be put on in one coat and because a thicker coating of rubber is usually needed in the center which is subjected to the greatest amount of abrasive action and wear. In this way conveyor belts can be given a new life as long as the original life of a new belt.

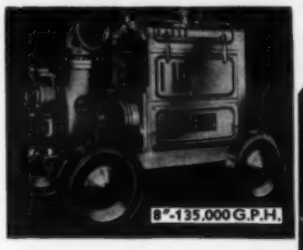
Our highway accident toll has so risen that in the United States last year almost 100 persons were killed, on the average, every 24 hours, while one person in every 100 of our population was injured in a highway accident.

Handbook for Welders

A revised and enlarged edition of the Procedure Handbook of Arc Welding Design and Practice has recently been announced by the Lincoln Electric Co., of Cleveland, Ohio. The present volume is some 140 pages larger than the preceding one, making a total of almost 600 pages, and contains over 700 illustrations consisting of detailed drawings and photographs. Practically every use and application of arc welding is covered.

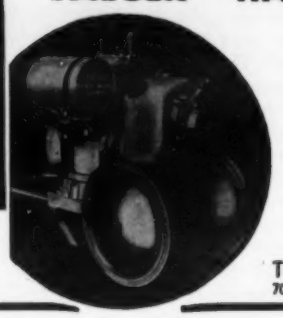
The book is divided into eight sections, each dealing with one important phase of welding. There are in addition several new features not contained in the preceding editions.

Copies of this book are available from the Lincoln Electric Co., Cleveland, Ohio. Price: $1.50, postpaid.



Get our catalog and prices on 100% automatic "Sure Prime" Pumps

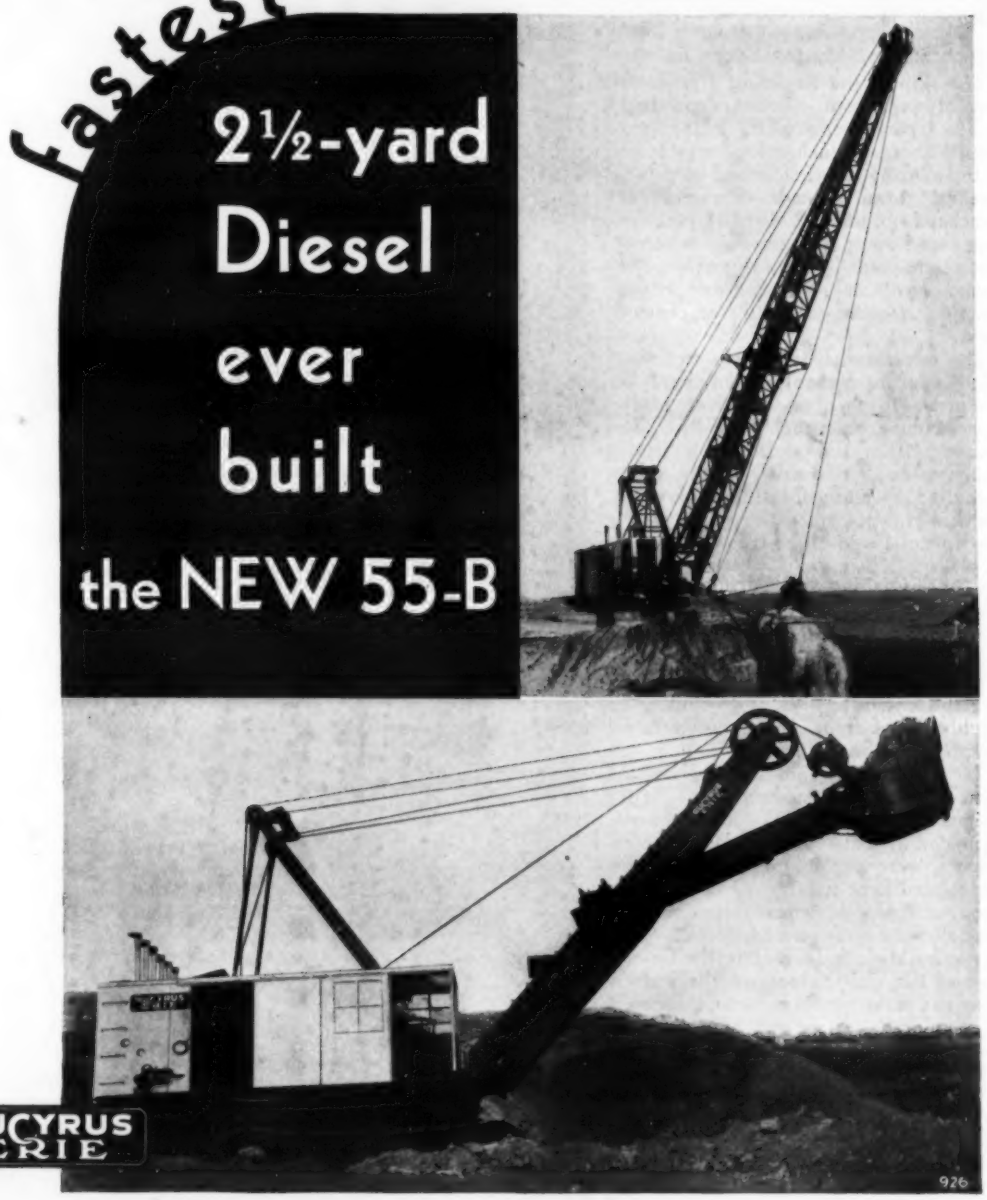
JAEGER "HANDY" PUMP



LOWEST PRICED 8,500 GALLON PUMP BUILT!

100% automatic priming —2½ H.P.—castings 20% steel — compact, light weight, rugged. Other sizes to 135,000 G.P.H.

The Jaeger Machine Co.
701 Dublin Ave., Columbus, O.



YOU get something new in modern earning-ability in the Bucyrus-Erie 55-B Diesel because this interesting 2½-yard excavator combines new output-ability, convert-ability, move-ability and ship-ability with Bucyrus-Erie's famous depend-ability. Find out about this able machine that means more profits for owners. It's the huskiest, fastest Diesel shovel-dragline-crane in anywhere near its size-class. Send for the 55-B bulletin.

BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

Snappy Concreting on Texas 11.5-Mile Job

(Continued from page 12)

heavy clamps held the headers firmly in place with one pin in each clamp. These were much easier to remove than the numerous pins on both sides of the headers. There were 18 dowels across each joint with the entire dowel dipped and coated with sand, and with a metal cap over the end away from the paver. The expansion joints were all packed with a mixture of cótton seed hulls, hot oil and Texaco asphalt. The joints were 1 inch wide at the top and ¾ inch wide at the bottom and the top inch was poured with asphalt filler.

Two men only were required to clean up the grade back of the subgrader followed by the two men to set steel and one to oil the forms. There were two center bars and two edge bars on each side. The latter were held in place prior to concreting by supports with levers to release the bars when the supports were to be lifted out. The center steel was held by double stirrups which were removed when the concreting reached them.

Clean Paver Skip for Every Batch

The skip of the Koehring 27E paver was always clean without depending on any laborer to pound it. A 50-pound weight about 18 inches long was hung in the skip by a 5-foot strand of cable. The cable ran through an eye about 6 inches from the end of the skip at the center and every time the skip went up the weight swung forward and on the return gave the skip a resounding thump that shook every bit of cement loose.

The paver and batch trucks ran outside the forms so that the steel men had the grade to themselves. There were four men shoveling and spading the concrete. They were followed immediately by an Ord finisher and a self-propelled Flexible Joint Machine Co. center strip placer. The center strip was in rolls and placed continuously.

Finishing and Curing

The 14-foot longitudinal float was operated from a rolling bridge by the two bull-float men, the remaining finishing being done by two straight-edge men and a joint finisher. Two belts and a rubber hose dragged over the surface completed the finishing.

The curing crew put on the burlap immediately after finishing and it remained in place for 10 to 12 hours. Then cotton mats, well soaked before placing, were put in the place of the burlap and kept wet for 72 hours and then removed. At some places where the slab was super-elevated it was necessary to build earth dikes along the lower edge of the slab to prevent the water from the mats running off and softening the grade where the trucks were running.

The curing crew stripped the forms and loaded them, about 100 to a load, onto a steel sled pulled by Caterpillar Sixty tractor.

Artesian Well Water

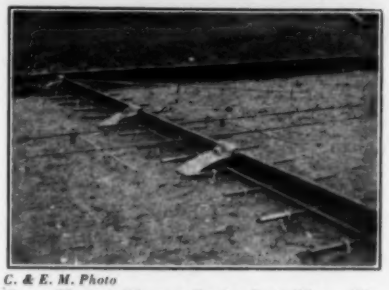
Water for the paver and curing was pumped from a deep well in Brazoria for part of the job and from an artesian well for the latter part. Airlift was used on the wells and a C H & E quadruplex pump on the 2½-inch pressure line along the shoulder. Valves were placed at 300-foot intervals. The paver carried 200 feet of 2-inch Goodrich Industrial hose with Boss couplings.

10-Hour Daily Shifts

The labor shifts worked 10 hours a day on a Thursday, Friday, Saturday, Monday, Tuesday, Wednesday schedule.

Personnel

This NRA project was completed in excellent time by the contractor, Russ Mitchell, Inc., of Houston, Texas, with H. E. "Red" Williams as Superintendent. L. A. Peterman was Resident Engineer for the Texas State Highway Department.



C. & E. M. Photo

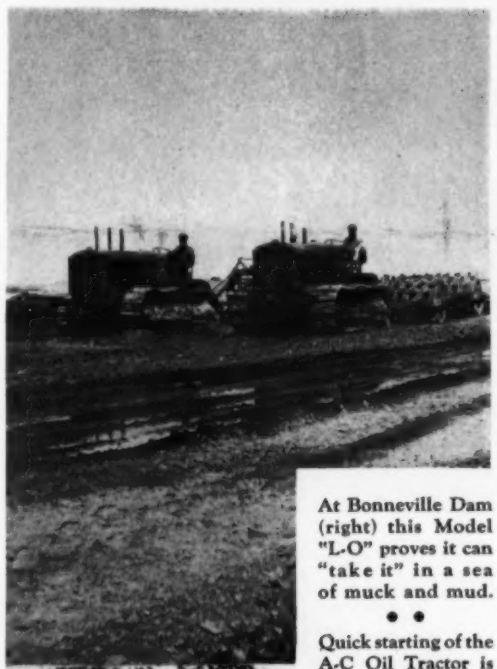
Four Heavy Clamps Instead of Many Pins Held the Expansion Joints Firmly

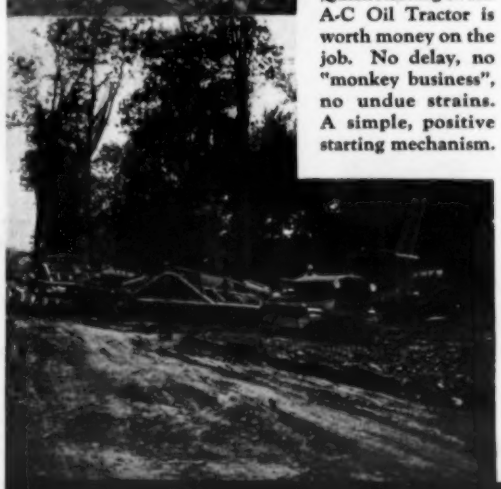
Trailer for Small Shovel

Low center of gravity and ease of loading and unloading have been stressed in the new trailer unit especially designed for the P & H Bantamweight excavator introduced earlier this year by the Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis. Loading is simplified by removing the front axle of the ⅜-yard excavator and placing ramp blocks to allow the machine to crawl above the frame, the front of which is then hoisted with the dipper so that the front wheels may be positioned as the machine settles onto the trailer. The process is reversed in unloading. Ten minutes is said to be the time for loading or unloading.

With four dual wheels and a wheelbase of 174 inches, the unit has a turning radius of only 30 feet. Fast travel is made safe by modern mechanical brakes on the rear wheels as well as an additional emergency hand brake. The main frame members are H beams of special alloy steel.

THE A-C HAS Wheels





At Bonneville Dam (right) this Model "L-O" proves it can "take it" in a sea of muck and mud.

• •

Quick starting of the A-C Oil Tractor is worth money on the job. No delay, no "monkey business", no undue strains. A simple, positive starting mechanism.

FOR SCRAPING .. GRADING .. BULLDOZING .. ROLLING

WHEN tractors are bought on actual performance records, Allis-Chalmers Oil Tractors are first choice. They have what it takes—not only Diesel Fuel economy but a simplicity of design that permits maximum work with minimum upkeep. In the mud and muck of Bonneville Dam...in the white hot heat of the All-American Canal...on big jobs from coast to coast...A-C Oil Tractors are demonstrating that the "low compression" principle is an outstanding forward step...that smoother operation and reduced wear have an important bearing on tractor costs. Don't rely on hearsay. Get complete, accurate facts about the new, improved principle of A-C Oil Tractors. See for yourself what they will do—on your job.

ALLIS-CHALMERS OIL TRACTOR

TRACTOR DIVISION—MILWAUKEE, U. S. A.

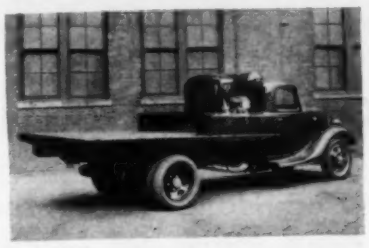
Smaller Sizes of Compressors Mounted on Standard Trucks

Contractors, state and county highway departments, having their own fleet of trucks, will find of interest the announcement of the Worthington Pump & Machinery Corp., Harrison, N. J., that the smaller sizes of Worthington Aero-2-Stage portable compressors are now mounted on standard trucks, the truck motor operating the compressor.

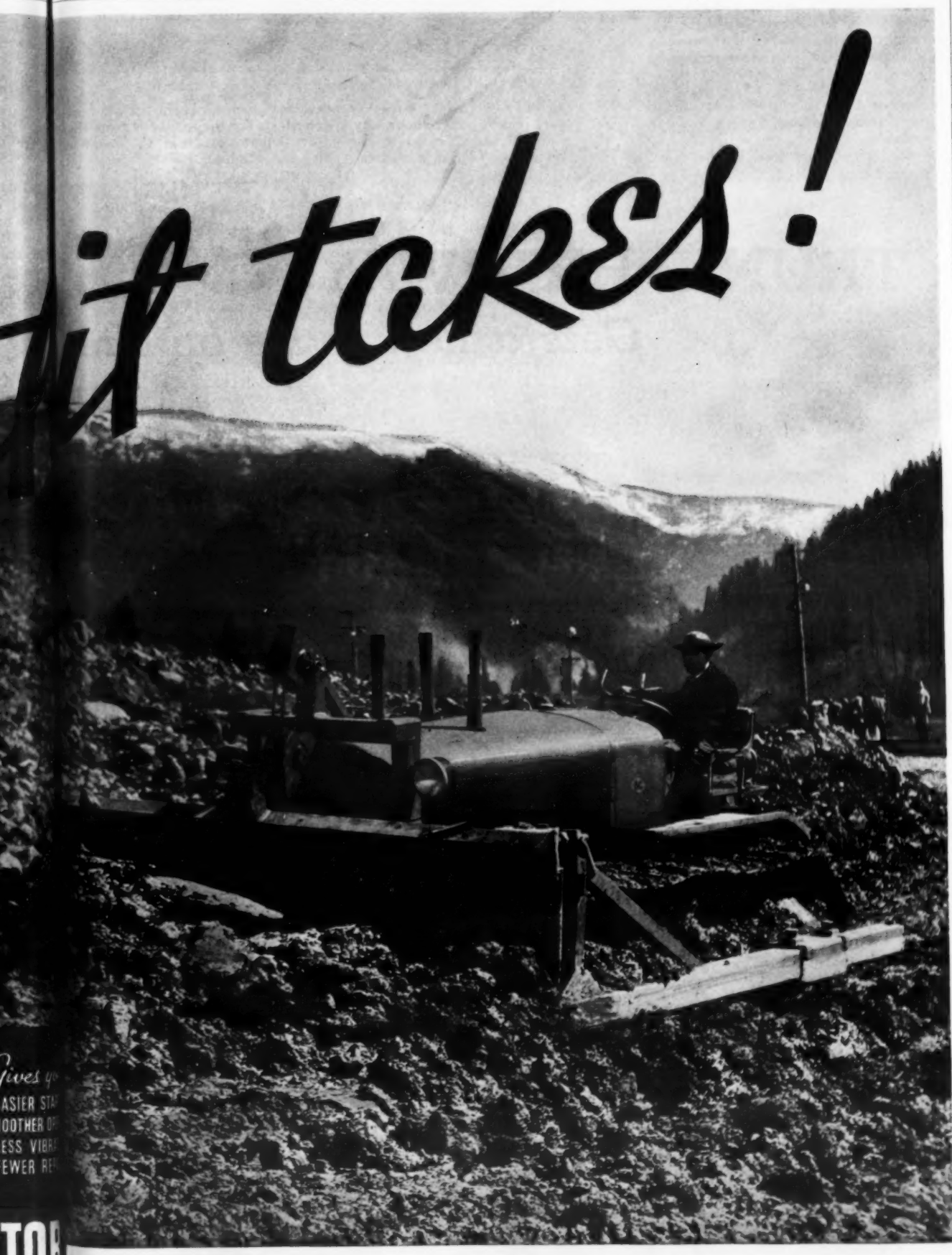
The accompanying illustration shows a typical application. Ample room is left on the truck floor for other loads after the compressor is installed.

The compressor is driven through a power take-off on the truck shaft through a Worthington Multi-V-Drive by the truck engine. The unit is rigidly mounted on the truck frame and belt tension is maintained by a ball bearing idler. The compressor is a three-cylinder air-cooled unit with an air-cooled intercooler. It has Timken tapered roller main bearings, force-feed filtered lubrication throughout and is equipped with Worthington patented Feather valves.

Mountings can be accommodated to any standard truck chassis and any standard or special body type best suiting the user's requirements.



One of the Worthington Aero-2-Stage Portable Compressors Mounted on a Standard Truck



N. Y. Grade Separation Prevents Hazards

(Continued from page 2)

surface. The backs of abutments were treated with a membrane waterproofing with a protection course. The completed waterproofing consisted of a firmly bonded membrane composed of two layers of fabric and three moppings of hot bituminous material at the rate of 15 gallons for 100 square feet of surface. For a protection course, one layer of common brick was used. Engineers who may use this method of protection course should bear in mind, while pouring the abutment, to form a bench in back of the abutment wide enough to hold the depth of a common brick.

Another factor which experience has shown to work to advantage is to place the porous tile underdrain in back of the abutment running longitudinally rather than spacing the pipe at right angles to the abutments. It has been found that when the pipe is placed at right angles the water that may drain through will cause an unsightly condition on the adjacent highway and a dangerous icy condition during winter months.

Quantities and Prices

There were 657 cubic yards of second class concrete of 1:2½:5 mix used in the bridge structure at a contract price of $10 and 809 cubic yards of concrete for structures of 1:2:3½ mix at a contract price of $12 a cubic yard. Two thousand, four hundred and forty-three barrels of cement were used at $2.25 per barrel, as well as 135,254 pounds of bar reinforcement at $.03 per pound. The total cost of the bridge structure was $38,725.

It required thirteen drainage structures to drain the area, ranging from an 18-inch cast iron pipe to 5 x 5-foot concrete culverts, and the following quantities were used:

Item	Quantity	Unit Price
Trench and culvert excavation	1,170 cubic yards	$1.00
First class concrete, 1:2:4 mix	450 cubic yards	12.00
Cement	715 barrels	2.25
Reinforcing for culverts	6,210 square feet	.20
18-inch cast iron pipe	90 linear feet	3.00
24-inch cast iron pipe	310 linear feet	5.00
Total cost		$11,240.75

Below are the total quantities used on this grade separation:

Item	Quantity	Unit Price
Embankment	64,600 cubic yards	$0.27
Concrete pavement, 1:1¾:3½ mix	4,426 cubic yards	4.50
Reinforcing for pavement	19,920 square yards	.20
Cement for pavement	7,195 barrels	2.25
Concrete curbing Type E	1,445 linear feet	1.50
Drainage structures		11,240.75
Bridge structure		38,725.00
Incidentals		2,500.00
Total Cost of Project		$112,165.00

This work was supervised for the New York State Highway Department by H. I. Dorfman, Engineer in charge, N. F. Ronan, County Assistant, and J. S. Bixby, District Engineer.

Maintaining Timber Bridges and Preventing Fires

The maintenance of timber bridges should be a matter of special consideration, said G. G. Wickline, Bridge Engineer, Texas State Highway Department, in an article on the use of timber on highway bridges in a recent issue of the *Wood Preserving News*.

All rubbish and debris which are likely to be used in starting a fire by wandering tramps should be removed and burned, and the space underneath the structure cleared. Also, all drift material should be removed. Special care should be taken by the maintenance organization to fill all seasoning checks with a hot solution of tar or other preservative liquid and effectively seal the interior of the timber from the entry of moisture and the development of fungi which rapidly cause decay.

Repaving in Traffic with Rock Asphalt

(Photo on page 36)

Codell Construction Co. Used Hand Labor and Road Roller on 1.2-Mile Job in Covington, Ky.

THE pleasure and enjoyment of the motorist driving over U.S. Route 25 through Kentucky were considerably marred as he descended into the City of Covington because of the condition of that section of the road. Therefore the Kentucky State Highway Department, in accordance with its program of modernization of the highways under its jurisdiction, awarded a contract last spring to the Codell Construction Co., of Winchester, Ky., for the paving of this link between the Covington corporation line and Pike Street in Covington, and the paving of Pike Street from its junction with the Dixie Highway to Main Street.

The total length of the job was 1.2 miles. Pike Street, which was paved with brick and granite blocks, was widened from 35 to 40 feet and repaved with 7-inch concrete for its entire width. New curb and gutters, sidewalks and car rails were also installed.

The section from the Covington corporation line to Pike Street was a 24-foot concrete road. This was widened to 40 feet, with a 7-inch concrete base. The work included one 42-degree curve widened to 70 feet and with a 5½-foot superelevation. It has a 2-course asphalt surface.

Laying the Asphalt

Work was carried on while traffic was maintained by allowing traffic to pass in one lane while the paving material was being applied and compacted in the other. The traffic count while work was in progress showed a minimum of 602 vehicles an hour, with a maximum of 936.

The base was primed with cut-back asphalt. For the binder course, a hot-mix hot-laid asphalt was used, mixed at 300 degrees F. in the plant 20 miles from the site of the job, spread 1½ inches thick at about 250 degrees F. and compacted to 1 inch by a Hercules 10-ton roller equipped with the Hercules Ironer Roll, a small diameter auxiliary roll attached to the rear of the three-wheel roller and operated hydraulically.

The Kyrock which was used for the wearing course was delivered by rail about 2 miles from the site and heated in the railroad cars by steam to a temperature of 210 degrees F., laid at 180 degrees and compacted to 1 inch.

On both courses, the material was spread in four lanes, with two shovelers and one raker to each lane. On the binder course an additional man was designated to level off. The initial rolling was done with the Ironer Roll, so that high spots were eliminated before the material was compacted. Then the roller with the Ironer Roll, forming a plane 17 feet in length, compacted and finished the job.

On the asphaltic binder course, 275 pounds initial hydraulic pressure was used on the auxiliary roll. On the Kyrock, the first pass of the auxiliary roll was made at zero pressure and the pressure increased slightly on subsequent passages. The State engineers checked more than 1,000 feet of one day's rolling without finding a single variation.

Two crews were used on this work with a combined average yardage of 7,000 square yards per 10-hour day.

This contract was awarded to the Codell Construction Co., of Winchester, Ky., for whom W. L. Harper was Superintendent. For the Kentucky State Highway Department, John C. Moore was Resident Engineer.

Resurfacing an Old Concrete Road at Covington, Ky.

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including Bridge deck slabs, Dams and Locks, Highway pavement and Concrete products.

Write for circulars and engineering data.

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Installation in Sauk Co., Wis.

GENUINE OPEN HEARTH IRON GOHI PURE IRON – COPPER ALLOY REG U.S. PAT OFF.

Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

WHEREVER a drainage problem needs to be permanently solved the logical answer is GOHI Corrugated Pipe. On the most traveled highway or on obscure roads, adequate drainage is a common requirement and there GOHI proves its worth. Decades of service and unmatched resistance against wear, weather and corrosion are built into every GOHI Corrugated Pipe. Repairs and upkeep are reduced to the minimum and maintenance costs vanish. Ask any GOHI fabricator for complete details.

St. Paul Corrugating Co.	St. Paul, Minn.
The Newport Culvert Co.	Newport, Ky.
New England Bolt Co.	Everett, Mass.
Tennison Brothers	Texarkana, Ark.
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Capital City Culvert Co.	Madison, Wis.
F. Yeager Bridge & Culvert Works	Port Huron, Mich.
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Denver Steel & Iron Works Co.	Denver, Colo.
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PRONOUNCED "GO-HIGH" CORRUGATED PIPE

GOHI CULVERT MANUFACTURERS, INC., . . . NEWPORT, KY.

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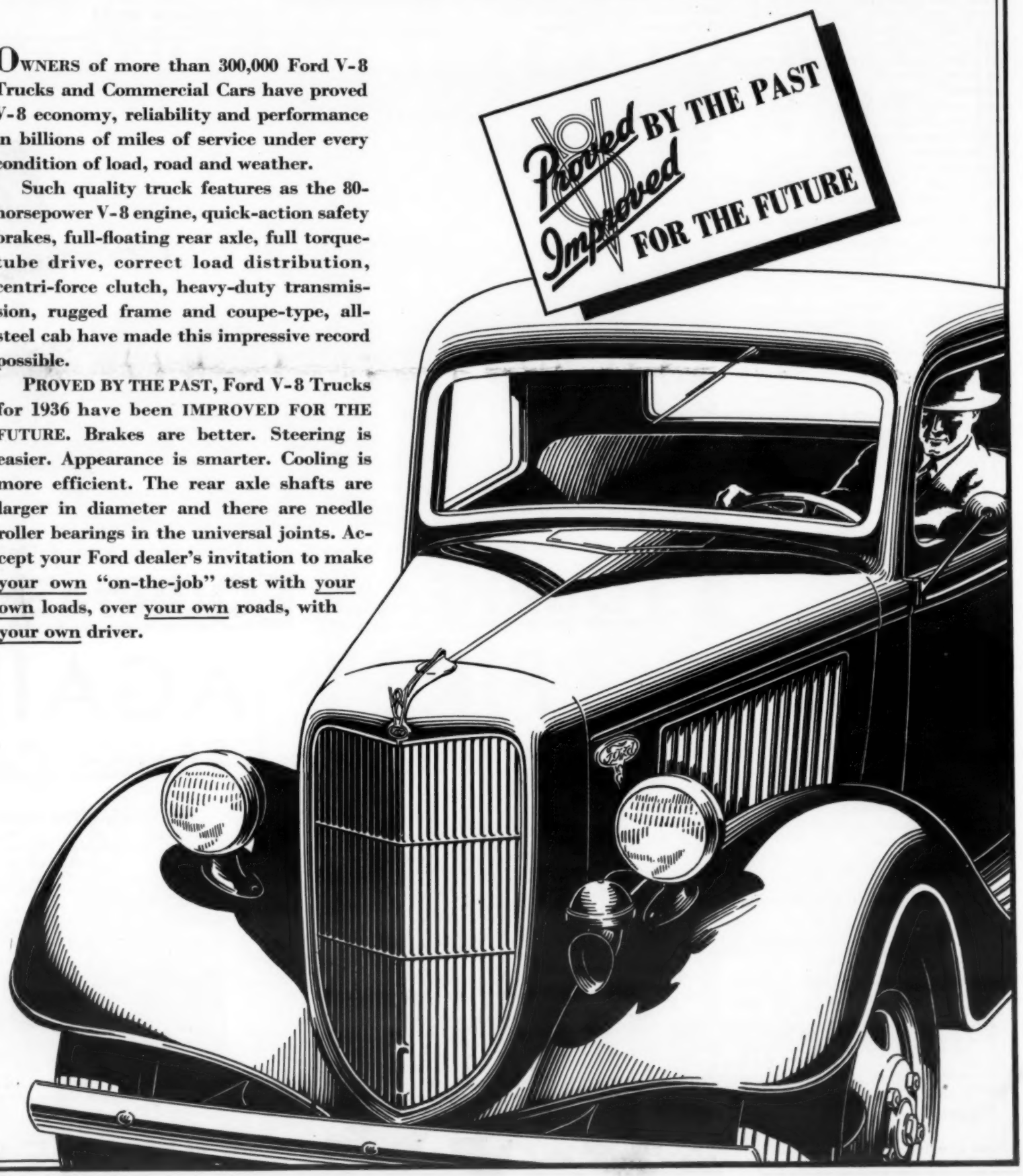
FORD V-8
TRUCKS AND COMMERCIAL CARS

OWNERS of more than 300,000 Ford V-8 Trucks and Commercial Cars have proved V-8 economy, reliability and performance in billions of miles of service under every condition of load, road and weather.

Such quality truck features as the 80-horsepower V-8 engine, quick-action safety brakes, full-floating rear axle, full torque-tube drive, correct load distribution, centri-force clutch, heavy-duty transmission, rugged frame and coupe-type, all-steel cab have made this impressive record possible.

PROVED BY THE PAST, Ford V-8 Trucks for 1936 have been IMPROVED FOR THE FUTURE. Brakes are better. Steering is easier. Appearance is smarter. Cooling is more efficient. The rear axle shafts are larger in diameter and there are needle roller bearings in the universal joints. Accept your Ford dealer's invitation to make your own "on-the-job" test with your own loads, over your own roads, with your own driver.



Handling Hawaiian Rock from Cliff to Job

(Continued from page 5)

cleaned up until it was as nearly vertical as possible. All holes were sprung before loading, using in most cases 50 pounds of 40 per cent du Pont quarry gelatin. All main shots were made with du Pont R.R. blasting powder. Most of the charge was in the powder pocket and was ignited by 50 pounds of 40 per cent quarry gelatin detonated with Cordeau. No trunk line was used but electric caps were connected to the Cordeau at the top of each hole. Dirt was shoveled into each hole for tamping and in no case was there less than 25 feet of it.

In this type of rock a considerable amount of explosive force is lost in cracks and cinder pockets so that, although underloading was necessary to save Class A stone, the usual charge of explosives was about ½ to 1¾ pounds per cubic yard of material in front of the holes. Generally the back break amounted to some 10 or 12 feet. The total powder consumption for all the work was 0.82 pounds of black powder and 0.22 pounds of dynamite per ton of breakwater rock. These figures are equivalent to 0.85 pounds of black powder and 0.23 pounds of dynamite for each cubic yard of rock excavated.

Equipment in the Quarry

The loading equipment in the quarry consisted of a 50-B Bucyrus-Erie 2-yard diesel shovel, a Bucyrus-Erie 1¼-yard gas and air shovel, a 50-B Bucyrus-Erie steam crane of 20-ton capacity, a Model 206 P & H machine, convertible into a shovel or crane as conditions required, and another Model 206 P & H crane.

One of the handiest pieces of equipment on the job was a Caterpillar diesel Seventy-Five which acted as a kind of jack-of-all-trades, used in making roads, bulldozing the waste rock dumped from the trucks, pulling down stones which might endanger the shovels, moving cap and slope stone, and clearing the ground preparatory to setting up the well drills.

Personnel

The Port Allen breakwater was built with money furnished under the PWA. The Kauai Railway Co., of Port Allen, was contractor and employed the Hawaiian Dredging Co., of Honolulu, as managers. Joel B. Cox, civil engineer for the McBryde Sugar Co., Ltd., was Consulting Superintendent; Herbert Hutchins was Quarry Foreman; A. A. Hartman, Breakwater Foreman and Kirk Miles, Assistant Superintendent.

The material and photographs for this article were furnished through the courtesy of *The Du Pont Magazine.*

Of our total of more than 3,000,000 miles of rural highways, only 5 per cent is hard surfaced and but 30 per cent has received any kind of improvement. The remaining 70 per cent represents more than 2,000,000 miles of wholly-unimproved highways.

Portable Electric Drill for One-Hand Operation

Weighing only 2½ pounds, a new portable electric drill claimed to be the smallest and lightest in weight ever built has been announced by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This new tool, the U-14 in ¼-inch capacity and the U-13 in 3/16-inch capacity, will drill through ¼-inch steel in 5 seconds.

The new drill incorporates the same features as the larger Thor units with hand wound armature, the special commutator construction and other modern features. The speed of the new U-14 unit is 2,500 rpm and its overall length 6¾ inches. The U-13 has a speed of 3,750 rpm, its dimensions being the same as the U-14.

Sauerman Slackline dumping sand and boulders on pile.

Low Cost Excavating

When you have a contract that requires moving dirt several hundred feet or more, isn't it logical to use a machine that will reach the entire distance and do away with any rehandling?

Sauerman Slacklines and Drag Scrapers will do just that—reach from 100 to 1500 ft. and handle the digging, hauling and placing of the dirt in one operation.

Write for new Catalog

SAUERMAN BROS.
464 S. Clinton St., Chicago

Small Sauerman Scraper making a highway cut-and-fill.

This 12-YARD CARRYALL was the first piece of mechanical equipment to move earth on the Trans-Florida Canal.

LE TOURNEAU EQUIPMENT

FIRST AGAIN!

on the Trans-Florida Canal

Last month at Ocala, Florida, hundreds of contractors gathered to prepare bids on the first letting of the proposed 270,000,000-yard cross-state ship canal. Before bidding, many of them wanted to know what LE TOURNEAU equipment would do in Florida sand. Dealer Burgman Tractor Company accommodated them, put a 12-YARD CARRYALL and big "75" on the job. Here is what the outfit did:

Delivered 290 loads in 18 hours, 35 minutes.
Average haul 660 feet one way.
Average time for complete cycle—load, haul and spread—3.84 minutes, or 15.63 trips per hour.
At 7 cubic yards excavation per load, this figures 109 cubic yards per hour.
Average travel speed, including load, haul, spread and return, was 345 feet per minute or 3.92 miles per hour.

These results amazed even us, who know that today 600 LE TOURNEAU CARRYALLS are moving bigger yardages faster and cheaper for contractors from Cape Cod to Bonneville. Ask your tractor dealer what job-proved LE TOURNEAU equipment can do for you; he will gladly show you data sheet proof of what it is now doing for others.

R. G. LE TOURNEAU, INC.
Peoria, Illinois Stockton, Califo
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Manufacturers of: ANGLEDOZERS, BULLDOZE CRANES, BUGGIES, CARRYALL SCRAPERS, RO ERS, POWER CONTROL UNITS, SHEEP'S FO ROLLERS, SEMI-TRAILERS.

12-YARD CARRYALL moving 109 cubic yards hourly a 660-foot one-way haul near Ocala, Florida.

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There's no closed season for ideas,
And there's always good hunting in

CONTRACTORS AND ENGINEERS MONTHLY

You're sure to bag:

Ideas on methods
Ideas on equipment
Ideas on organizing the job
Ideas on lopping off unnecessary expenses
Ideas that may save you hundreds of times $1 in the course of a year

And the "license" costs you only $1 a year!

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$1 in stamps enclosed.

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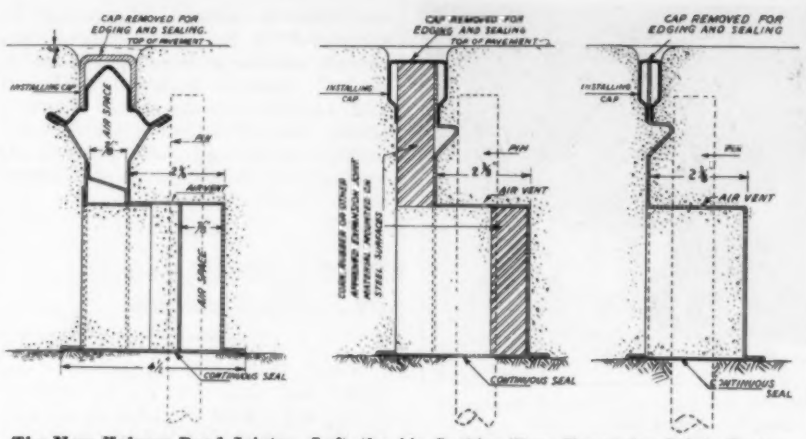
New Concrete Road Joints

Two types of transverse expansion joints, air-cushion and elastic-cushion, and a contraction joint of similar design have been developed by the Kalman Steel Corp., subsidiary of Bethlehem Steel Corp., Bethlehem, Pa. These joints, designed to preserve smooth and even concrete highway surfaces and to permit free movement of the pavement under both expansion and contraction, are shop-assembled, self-contained, concrete-interlock units requiring only the labor of setting in place on the subgrade and staking to prevent movement while concreting. Their design embodies a system of interlocking lugs and recesses formed directly in the concrete, proportioned and spaced to use the strength of the concrete to advantage. The bottom, top, and ends are arranged to prevent the entry of foreign materials into the body of the joint.

In the air-cushion type, there is a 7/8-inch air space transversely in the joint, while in the elastic-cushion type specified material such as cork, rubber, or other approved expansion joint material is mounted on steel surfaces. The detail of the contraction joint embodies all the features of the interlock joint, such as bottom and top sealing, but with the expansion provision omitted. Thickened edges, crown, curb extensions and other features of good pavement design are provided for in the manufacture of these complete road joints which are described in Folder No. 302 which is available upon request.



The New Kalman Road Joints: Left, the Air-Cushion Type Expansion Joint; Center, the Elastic-Cushion Expansion Joint; and Right, a Contraction Joint

Paint and Paint Materials

A Symposium on Paint and Paint Materials, including fifteen technical papers on almost all phases of paint, varnish and lacquer, has recently been published by the American Society for Testing Materials. Each of the authors is an outstanding technologist in his field and the data presented are of particular interest.

Copies of this Symposium, 150 pages, may be obtained from the American Society for Testing Materials, 260 So. Broad St., Philadelphia, Pa. The price is $1.50 for the cloth bound volume and $1.25 for the paper-covered volume.

FEATURES?—SURE—LINK-BELT FEATURES THE WHOLE UNIT

"Special features" count for little unless the construction of *every* working part in the whole machine excels. For years the Link-Belt has worked with many of the world's most efficient contractors on their toughest jobs, proving over and over the vital necessity for machinery being built "good all the way through." Let one part weaken in its functioning and other parts are thrown out of adjustment—wear sets in—loss of service and money results. The whole Link-Belt unit—is built for stability, power and speed.

From 3/4 to 3 yds. capacity, heavy-duty built. Gas engine, Diesel, or electric motor drive. All models can be shipped loaded on a flat car without dismantling.

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To Pikes Peak or Bust! In This Case, It Was to the Peak, in a Record Run of 37 Minutes 52½ Seconds for This 1½ Ton Truck.

Chevrolet Trucks Tested at Pikes Peak

In the first formally observed and timed test of motor trucks over the perilous hairpin turns and steep switchbacks of the Pikes Peak auto highway, near Colorado Springs, Chevrolet 1½ and ½-ton trucks demonstrated their power and endurance on the course of the annual Labor Day hill climbing contest, a distance of 12 miles 2,200 feet, with a rise of 4,959 feet from the start to the summit, 14,109 feet above sea level.

The 1½-ton truck, driven by W. P. Bentrup, carrying its full 3,000-pound load, made its way to a record of 37 minutes 52½ seconds; and the ½-ton pick-up truck was driven to the summit by Harry Hartz in 25 minutes 3 seconds.

Rock Asphalt Institute Elects Officers

George Rapp, Vice President of the Ohio Valley Rock Asphalt Co., has been elected President of the newly-formed Kentucky Rock Asphalt Institute at its organization meeting held in the Institute offices at the Marion E. Taylor Bldg., Louisville, Ky. Walter Arata, Vice President of the Natural Rock Asphalt Corp., was elected Vice President and W. N. Bosler, Assistant Sales Manager of the Kentucky Rock Asphalt Co., will serve the Institute as Secretary and Treasurer.

The following will serve as the first Board of Directors: Rodman Wiley, Sales Manager, Kentucky Rock Asphalt Co.; Phil McGovern, Sales Manager, Ohio Valley Rock Asphalt Co.; and G. C. Appleton, Chief Engineer, Natural Rock Asphalt Corp. A. H. Hinkle, former Deputy Highway Commissioner of Ohio and later Superintendent of Maintenance for the Indiana State Highway Commission, was appointed Executive Director.

The purpose of the Institute is to place at the command of officials and private citizens reliable information and cooperation as to where, when and how both natural and processed Kentucky rock asphalt can be used to economical advantage in the surfacing of streets, highways, park roads, driveways and other places where a smooth, resilient, non-skid surface is desired.

Contract for Final Section of Interboro Parkway Awarded

The contract for the final section of the Interborough Parkway connecting Pennsylvania Avenue, Brooklyn, with Grand Central Parkway at Kew Gardens, Long Island, N. Y., has been awarded to the Garofano Construction Co., of Mt. Vernon, N. Y., on a bid of $166,503.75.

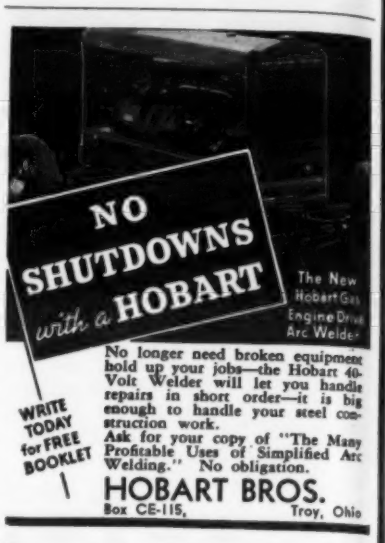
The work included in this contract provides for the paving of the last mile of the Interborough Parkway between Pennsylvania and Vermont Avenues. Since the opening on July 26 of the easterly section of the Parkway, contractors engaged on the paving and bridge construction along the balance of the parkway have been progressing at top speed to insure the completion and opening of the entire parkway to traffic this year.

At Highland Boulevard, the construction of three new grade separation bridges and the reconstruction of the old Vermont Avenue Bridge will be completed in November. These four bridges and the wide entrance plaza to be built between Highland Boulevard and Jamaica Avenue under the new paving contract will permit a free and unrestricted flow of traffic between the parkway and the important cross streets in the vicinity.

Field Angles Speeded by Protractor Scale

A scale that can be carried in the vest pocket and which does for the engineer on any angle what the 3-4-5 layout does for the right angle has been developed by Lew Koen, 654 Schenck Ave., Brooklyn, N. Y. in his Triangular Protractor.

The Triangular Protractor scale is a tabular device for measuring and computing angles, triangles, and complicated figures with great accuracy. It is based on the principle of triangulation with a base of 12 inches and an altitude corresponding to the required angle up to 45 degrees; and with variations for larger angles. It also may be used as a decimal conversion scale.



No longer need broken equipment hold up your jobs—the Hobart 40-Volt Welder will let you handle repairs in short order—it is big enough to handle your steel construction work.
Ask for your copy of "The Many Profitable Uses of Simplified Arc Welding." No obligation.
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● *Ingersoll-Rand Portable Compressor, powered by 110 hp. Waukesha Hy-Pour Gasoline Engine, on barge moored in river channel, outside coffer dam, used by Columbia Construction Co.*

WAUKESHA ENGINES ON THE JOB AT THE BONNEVILLE DAM

● Excavating for lock and powerhouse area in Bradford Slough. Ingersoll-Rand Portable Compressor, powered by 100 hp. Waukesha-Hesselman Engine, on Guy F. Atkinson contract.

● Not only on the Bonneville Dam job, in air compressors—but in thousands of jobs, for every industrial use, Waukesha-Hesselman Oil Engines and Waukesha Hy-Powr Gasoline Engines are establishing in all parts of the world impressive records for long-time, day-in-day-out operation at remarkably low up-keep costs.

About the same size and weight as a gasoline engine, the Hesselman Oil Engine starts as easily, runs as smoothly, develops equal or greater power, and is moderate in first cost. Burning the modern high speed Diesel fuels, *its fuel cost is extremely low*, and it is so simple in construction that anyone understanding gasoline engines can operate it.

Waukesha-Hesselman Engines . . . for industrial tractors, road building, logging, oil field, and contractors' machinery, electric lighting and power plants, as well as trucks and marine propulsion . . . are made in a wide range of sizes from 20 hp. to 300 hp., both four and six cylinders.

Write for Bulletin 1000. Waukesha Motor Company, Waukesha, Wisconsin.

WAUKESHA ENGINES

Progress in Road Work on Dark Continent

(Continued from page 11)

Conditions in Other Countries

The State of Algeria proposes, in addition to certain new construction, to take over about 950 miles of roads (country, commercial and rural) each year for three years, for maintenance. In 1933 the State budget for highways was about $7,451,000 and $822,780 allotted toward the upkeep of secondary roads. Highways have, so far, superceded the railroads in Algeria and the grading of highways has now reached such an extent that it seems that machinery alone can provide efficient maintenance of the existing mileage. Some units of American road machinery are being used experimentally across the desert between French North and Central Africa.

Highways in Belgian Congo are secondary in importance to water transportation. Roads are constructed both by provincial authorities and by private interests. The policy of the Government is that no roads shall be constructed which parallel an existing railroad or navigable river. The automobile roads are reported as excellent, though they are built entirely from local materials and not hard surfaced.

The Canary Archipelago, a separate maritime dependency of Spain, has macadamized most of its highways and surface-treated with tar about one-fourth of the limited mileage. Funds for highway purposes are received from the Spanish Government at Madrid, from the gasoline tax and a special tax on transport.

In British East Africa, consisting of Kenya Colony, Uganda Protectorate, Tanganyika, Zanzibar Protectorate and Pemba and Seychelles Island, the budgets for road purposes have provided for the construction of a system of low-cost roads fairly adequate for the available motor traffic. The program of Kenya Colony for 1933 included £4,000 for the improvement of about 50 miles of country roads and £60,800 for the maintenance of existing routes. In these colonies funds are derived usually from loan funds for construction and from general revenue for maintenance. In Tanganyika, Zanzibar and Pemba all funds are from general revenue. No concrete is used in road construction in the British East African colonies, and only a small amount of asphalt products are used.

Road and street construction is under federal contract in Egypt and in the past two years, most of the expenditures have been on the streets of Cairo and Alexandria, with only nominal amounts allocated for widening and improving a few of the main highways. With only 240 miles of hard-surfaced roads there is much room for improvement when funds become available. Some of the city streets are of asphalt, as well as the roads leading to the Pyramids and other places of interest to tourists.

In the Union of South Africa, with its sparseness of population and the comparatively long distances between the larger cities and towns, the construction of roads has largely been confined to opening and maintaining gravelled connections. Certain sections in and around Capetown, Durban and Johannesburg are being macadamized and surface-treated with bituminous materials. Maintenance has been a particularly difficult problem, as even the main roads are only of dirt and gravel, but with a wider use of mechanically-driven graders, the average road condition has improved within the past few years.

In French Equatorial Africa and the Cameroons and Togo mandates, since 1925 there has rapidly developed a system of highways for motor vehicle traffic, and the system is constantly being extended and improved by the respective Public Works Departments. Main intercolonial routes, the great trails of commerce in Central Africa, converge in the region of Chad. General and local budgets provide the funds. Labor is cheap and abundant and machinery is not used to any extent.

In addition to the 4,970 miles of motor roads reported for French West Africa, there are about 31,000 miles of trails which are suitable for motor travel during the dry season of about 8 months. The road construction for these colonies of Senegal, French Guinea, Ivory Coast, Dahomey, Mauritania, French Sudan and Upper Volta is handled by the Department of Public Works. Labor is cheap and machinery is not used to the extent it is in other countries.

The highways of French Morocco are all surfaced with macadam. Forty per cent of the main roads and 15 per cent of the secondary roads are surface-treated with tar or bituminous material, the system comparing favorably with the roads of rural France.

The three Somalilands, British, French and Italian, have but little rainfall and most of the roads are cleared tracks through the jungle and near desert areas. In British Somaliland the annual expenditures are approximately $22,755, mostly for maintenance. Motor transport is very popular as there are no railroads, but the roads are all dirt, easily constructed because of the nature of the terrain.

The following table and other statistical data in this article are based on information furnished by the Bureau of Foreign and Domestic Commerce.

Comparison of Area and Road Mileage

Country	Area Square Miles	Road Mileage	Area to 1 Mile of Road
Algeria	847,523	32,736	26.2
Anglo-Egyptian Sudan	1,006,000	25,270	39.9
Angola	484,800	23,313	28.0
Belgian Congo	920,849	27,065	34.0
Br. So. Africa	437,950	11,061	39.5
Br. So. West Africa	322,400	817	394.6
Canary Is.	3,021	932	3.2
Egypt	386,000	4,178	92.4
Eritrea	45,754	2,233	20.5
Ethiopia	347,490	2,730	127.7
Fr. Eq. Africa	915,057	14,262	64.2
Fr. W. Africa	1,854,714	27,301	68.8
Gambia & Prot.	4,134	869	4.4
Gold Coast	80,000	5,936	13.5
Kenya Colony	225,100	7,560	29.8
Liberia	46,332	234	198.1
Libya	422,831	3,200	132.1
Madagascar	227,734	8,040	28.3
Madeira	314	555	0.6
Mauritius	720	700	1.0
Morocco, Fr.	162,000	3,961	40.9
Morocco, Sp. & Int. Zone	9,105	1,393	6.5
Mozambique	297,734	14,567	24.0
Nigeria	372,674	14,450	25.8
Nyasaland	37,890	3,142	12.0
Portuguese Guinea	36,125	1,860	19.4
Reunion	970	655	1.5
Seychelles	156	153	1.0
Sierra Leone	31,000	972	31.9
Somaliland, Br.	68,000	1,000	68.0
Somaliland, Fr.	5,790	25	231.6
Somaliland, It.	190,000	6,200	30.6
So. Africa, Union	471,917	111,336	4.2
Spanish Guinea	10,036	194	51.7
Tanganyika	373,500	19,075	19.6
Tunisia	48,500	7,143	6.8
Uganada	94,024	7,028	13.3
Zanzibar & Pemba	1,020	243	4.2
Total	10,790,969	392,389	27.5

Light Sinker Drills for Soft Rock

Two new light sinkers particularly suited for shallow drilling in soft to medium rock formations and which are of small size, light weight and low air consumption, making them particularly adaptable for use in restricted quarters, maintenance work around industrial plants, flat or upward drilling and where the air supply is limited, have been announced by Chicago Pneumatic Tool Co., 6 E. 44th St., New York City. The machine is reported to have exceptional drilling speed, rotative strength and hole-cleaning capacity, considering its size and weight.

The CP-22 has a net weight of 28 pounds and an overall length of 19⅞ inches. Its economical drilling depth is between 6 and 8 feet. It is operated from a ¾-inch air hose and carries a ⅞ x 3¼-inch hex drill steel.

This is the unit that

ETNYRE

built

to improve an already remarkable line of bituminous distributors

1. *A more compact assembly* of pump, valves and circulating system reduces the weight about 300 pounds, permits the unit to be mounted 4 inches lower on the truck without reducing the road clearance of the spray bars, makes insulation easier, and allows the valves to be readily heated from the motor exhaust.

2. *The new leakless valves* eliminate the drip-drip which has up till now been so annoying to operators.

3. *The new fifth-wheel-driven tachometer* is proving more accurate and satisfactory than either front-wheel or transmission drive. The fifth wheel is raised, when the truck is on the way to or from a job.

504—Write just this number—504, on a post-card with your name and address, and we shall be glad to send you a copy of our Bulletin No. 504 which will give you further interesting facts concerning this new ETNYRE.

E. D. ETNYRE & CO.

DEALERS IN ALL PRINCIPAL CITIES

400 JEFFERSON ST., OREGON, ILL.

MODEL FO2

C. & E. M. Photo
Steady Pumping by This Unit Kept the Job in the Dry.

Rock and Quicksand on 2-Mile Sewer Job

(Continued from page 1)

long. For deeper trenches, double sheeting was used. The braces were 6 x 6 and 8 x 8 timber and the wales 6 x 8 and 8 x 8 timber. All sheeting was driven with I-R No. 3 pneumatic hammers. The excavation between the braces was done with a 1-yard Owen clamshell bucket.

Wellpoint Sections

Through sections about 1,000 feet long on Central Park Avenue and Canfield Street there was a layer of hard pan from 6 to 18 inches thick just below the grade of the sewer. On top of this was fine running sand with some water in swampy sections and, below the hard pan, a boiling quicksand. The hard pan was so thin in spots that it broke through from the pressure below when driving sheeting and when the pressure of the top soil was removed. If the hard pan was as much as 2 feet thick, wellpoints were not required as it had sufficient strength to withstand the pressure of the fluid quicksand below.

For the sections where wellpoints were needed, the contractor leased Griffin Jet 'N Drive points which were driven 3 feet on centers on one side of the trench only. These wellpoints have 1½-inch risers leading through goosenecks to a 6-inch header with Dresser couplings. A Worthington wellpoint pump maintained a 22 to 25-inch vacuum. There was comparatively little water to be removed by the wellpoint system, but the pump and points kept the quicksand dry and stopped the boiling through breaks in the layer of hard pan.

Section on Piles

One section about 1,035 feet long was built on piles because of the excessive depth of soft ground. The piles were driven with an Osgood steam crane using a McKiernan-Terry 9B pile hammer. The piles, which received a 16-pound creosote treatment before delivery, had 12-inch butts and varied in length from 15 to 55 feet.

On the work were three Lorain backhoes, two Northwest cranes, two Byers cranes and one P & H crane, in addition to the pneumatic equipment and ample service and hauling trucks.

Personnel

The original contract for the construction of this intercepting and trunk line sewer was awarded to Mosher & Dunnigan for $186,669.00. Mr. Dunnigan died suddenly on the job and the company retired from the contract which was taken over by the Standard Improvement Corp., of Westchester County with offices at Ardsley, N. Y. This company used about 175 skilled and unskilled laborers, working 30 hours a week and 8 hours a day for operators and two 5-hour shifts for laborers. John N. Heeney was Consulting Engineer for the town of Greenburgh with Bradford Clark as Resident Engineer. Capt. C. P. Poindexter was PWA Resident Engineer-Inspector. For the contractor, Arthur T. Armstrong, Chief Engineer, was in charge. Joseph Miele is President and Anthony P. Miele, Treasurer, of the Standard Improvement Corp. of Westchester County.

C. & E. M. Photo
Arthur T. Armstrong, Chief Engineer for the Contractor

New Traffic Line Markers

Two new traffic line markers which will mark lines on any kind of hard surface and which are suitable for applying any color paint and also hot or cold asphalt have been announced by Municipal Supply Co., South Bend, Ind. In both machines, the Hand Marker and the Wheel Marker, the paint feeds by gravity.

The Hand Marker carries three quarts of paint in its seamless steel tubing handle while the Wheel Marker has a capacity of five gallons and is made of heavy sheet steel. The brushes for both machines are of black China bristles with a two-row brush in front for cleaning and a four-row brush in the rear for applying the paint. The bristles are sewed into removable hardwood blocks with asbestos separators between the rows. The brush holders are malleable castings, machined to hold the removable brush blocks and side plates which are self-adjusting to produce straight-edge stripes.

On the larger Wheel Marker, the chassis is a structural steel frame with 10-inch disc type wheels and a swivel caster forward, all equipped with 1¼-inch cushion rubber tires. The control on the Wheel Marker is offset, permitting the operator to walk at one side of the stripe. A grip lever on the right handle operates the paint supply valve.

Annual Safety Congress Urges Accident Prevention

A concentrated drive against a common enemy—accidents—was made when some 7,000 delegates from all walks of life and representing all types of industries, from all parts of the United States and several foreign countries, assembled at Louisville, Ky., for the 24th Annual Safety Congress and Exposition in October.

The addresses included a talk by Thomas Bentley, President, A. Bentley & Sons Co., of Toledo, Ohio on the prevention of construction accidents; safety in construction work, by Welton A. Snow, Safety Director, Associated General Contractors of America, Inc., Washington, D. C.; some major factors in construction safety by Paul F. Stricker, Safety Engineer, U. S. Department of Labor; and safety on the San Francisco-Oakland Bay Bridge.

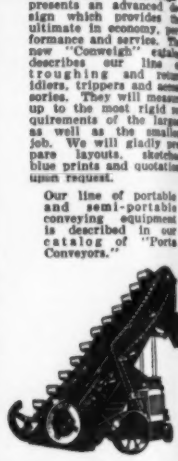
Complete details of the Congress and copies of the various discussions may be secured from the National Safety Council, 20 No. Wacker Drive, Chicago, Illinois.

"Conweigh" anti-friction closed end conveyor idlers furnished with ball or roller bearings and malleable iron brackets mounted on plank or channel base. Arranged for pressure lubrication.

"CONWEIGH" CONVEYING EQUIPMENT

"Conweigh" originated the first anti-friction troughing and today "Conweigh" presents an advanced design which provides the ultimate in economy, performance and service. The new "Conweigh" catalog describes our line of troughing and return idlers, trippers and accessories. They will measure up to the most rigid requirements of the large as well as the small job. We will gladly prepare layouts, sketches, blue prints and quotations upon request.

Our line of portable and semi-portable conveying equipment is described in our catalog of "Portable Conveyors."



PORTABLE MACHINERY CO.
Division of A. B. FARQUHAR CO., Limited
Box C-1, York, Pa.

New F-25
Handles 4 cu. ft. wet concrete
LANSING Contractors' Barrow
. . . *with Pneumatic Rubber Tire*
and Roller Bearing
LANSING COMPANY
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Chicago New York Minneapolis Boston
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PORTABLE ASPHALT PLANTS
TOWER TYPE
LARGE CAPACITIES
HOT OR COLD MIX
Accurate control of materials to comply with any standard specifications for bituminous mixtures.
Send for Bulletin T-248
HETHERINGTON AND BERNER INC
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Where Rugged Power Is Needed for Heavy Work

This truck, powered by 4-cylinder 83 H. P. CUMMINS Diesel, hauls heavy mine supplies for Homestake Mining Co., Lead, S. D.

CUMMINS DIESELS DO THE JOB

For all kinds of heavy-duty service—automotive, portable or stationary—CUMMINS Diesels will give you BIG SAVINGS in your power costs.

These efficient, dependable engines give you Diesel power at its best! The famous CUMMINS Low-Pressure Fuel System—originated by CUMMINS engineers and available only in CUMMINS Diesels—is acknowledged as the greatest Diesel improvement ever developed. Write for full information.

CUMMINS ENGINE COMPANY, COLUMBUS, INDIANA
The Leader in Diesel Engineering Advancement
● SALES AND SERVICE FROM COAST TO COAST

A New 10-S Mixer

New Four-Wheel Mixer

The T. L. Smith Co., of Milwaukee, Wis., manufacturer of concrete mixers since 1900, has recently added to its line a four-wheel end-discharge model in the 10-S size. This new machine, compact and light in weight, combines the advantages of the two-wheel end-discharge model with four-wheel truck stability.

The truck design of this new unit provides for a 5-foot wheel base. Automotive-type steering axle, three-point suspension with spring mounting, and balanced weight permit fast towing speeds. The engine mounting on the right-hand side avoids any overhang on the traffic side and the telescopic tow bar folds back while the mixer is in use.

Other construction features include the Smith end-to-center mixing action, enclosed gear reduction running in oil, multiple V-belt drive, automatic skip vibrator, anti-friction bearings throughout, and one-man end control. It is also equipped with a new vertical syphon-type water measuring tank with calibrated gage to insure accuracy in measuring the water for the mix.

New Junior Electric Drill

As a companion to its ¼-inch Junior drill, the Black & Decker Mfg. Co., Towson, Md., has announced a new ½-inch Junior drill for cutting holes in wood, sheet metal, cast iron, and composition material. This tool is amply powered for drilling holes in steel up to ½-inch size and for driving wood augers up to 1¼-inch size.

The standard voltage is 110 but the drill will also be supplied for 32, 220 and 250 volts without additional charge. It is furnished complete with Compo oilless bearings, safety switch, 3-jaw chuck and key, spade handle and auxiliary pipe handle.

Portable Air Compressors in Four Sizes and Mounts

Four models of Aero 2-Stage portable compressors for delivering 105, 160, 210, and 315 cubic feet of air displacement per cubic feet of actual air per minute for use wherever a mobile compressed air plant is needed by contractors, railroads, and others, are now offered by the Worthington Pump & Machinery Corp., Harrison, N. J. The first three units are compact, with balanced-angle, two-stage, air-cooled, unit-assembly and clutch connection to heavy-duty 6-cylinder gasoline engines. They operate at 830 rpm and have an air pressure of 100 pounds gage.

The 105 model may be had with the following mountings; skid-mounted, steel wheel, solid rubber or pneumatic-tired towabout, four-wheel solid rubber or pneumatic-tired spring trailer, two-wheel single-axle spring trailer with solid rubber or pneumatic tires, truck-mounted, power take-off drive, rail car or mine car. Other models are mounted to meet service requirements. Complete details on these units are available in four bulletins which may be secured direct from Worthington.

DIESEL DRAGLINES
DIESEL AIR COMPRESSORS

4 50-B Bucyrus Erie Diesel Draglines, 50-ft. boom, 10-ft. extension, Atlas engine, caterpillar mounting.
2 775 P & H Diesel Draglines, 50 ft. boom, Atlas engine, caterpillar mounting.
2 Ingersoll Rand POC 600-ft. Diesel engine Air Compressors, practically new.

The above are part of the surplus construction equipment of the Middle Rio Grande Conservancy District. Wire or write for list of all equipment, which includes pumps, compressors, lighting plants, tractors, shovels, pile driving outfits, concrete mixers, scales, Insley concrete placing outfit, concrete heaters and vibrators, gravel screening plant, compressed air drill sharpeners, shop equipment, gasoline powered hoists with and without skips, bar benders and cutters, carbic floodlights, and other items at bargain prices.

Discounts to large users and dealers.

R. L. HARRISON CO., INC.,
ALBUQUERQUE, NEW MEXICO

GEORGE HAISS MFG. CO., Inc. **HAISS** Canal Pl. & E. 142 Street New York

Send me full details and prices on equipment checked

FACTORY REBUILT CLAMSHELL BUCKETS
☐ 1—Haiss Rehandling 1⅛ yd. Bucket
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☐ 1—Haiss 1 yd. Contractor Type Bucket
☐ 1—Hayward ¼ yd. Class "E" Bucket
☐ 1—Williams ⅜ yd. Lever Arm Bucket
☐ 1—Hayward 1¼ yd. Type "E" Bucket

Factory Rebuilt Truck Loaders and Belt Conveyor
☐ 1—Haiss 2 yd. a min. Creeper Truck Loader
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JAEGER Adjustable SPREADER

SMOOTHLY SPREADS STONE, MACADAM AND BITUMINOUS—1" TO 10" OF LOOSE MATERIAL, 8 TO 11 FT. WIDTHS.

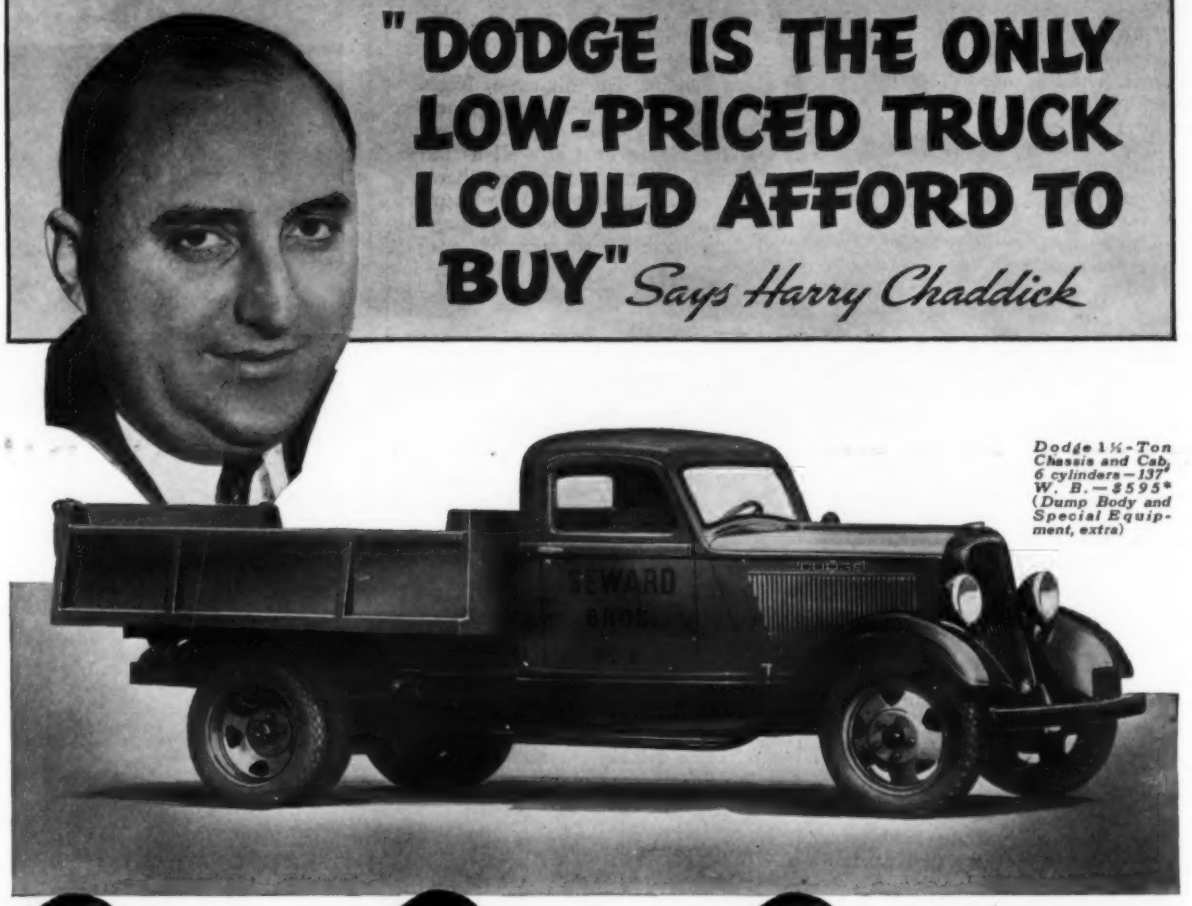
Lays low cost roads, faster, smoother and with real savings.

JAEGER BITUMINOUS PAVER

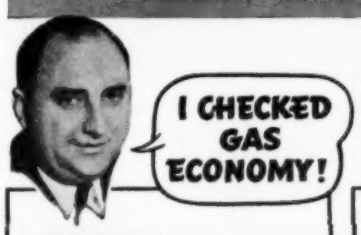
power-driven, adjustable 9 to 15 ft., does precision job without forms. Write for details.

The Jaeger Machine Co.
701 Dublin Ave., Columbus, Ohio

"DODGE IS THE ONLY LOW-PRICED TRUCK I COULD AFFORD TO BUY" *Says Harry Chaddick*



Dodge 1½-Ton Chassis and Cab, 6 cylinders—137" W. B.—$595 (Dump Body and Special Equipment, extra)*



FULL LENGTH WATER JACKETS—The most modern type of engine construction! Cools cylinders their entire length. Saves gas and oil, also prolongs engine life.

SPRAY-COOLED EXHAUST VALVE SEATS—"Spray-cooling" keeps exhaust valve seats cooler. Lengthens life of exhaust valves. Helps to reduce valve grinding.

VALVE SEAT INSERTS—of alloy steel. Won't pit or burn like ordinary engine block metal. Make valves seat better. Save gas . . . valve grinding.

FULL-FLOATING REAR AXLE—Dodge pioneered this fine truck feature in low-priced trucks. Saves repairs . . . cuts upkeep expense.

HYDRAULIC BRAKES—Genuine Dodge hydraulic brakes stay equalized. Stop quick. Save money on tires, brake relining, and adjustments.

SAFETY-STEEL CAB—Among the three lowest-priced trucks, Dodge gives you the best type of cab. Safety-steel welded construction.

"NOW I'M SAVING OVER $90 THIS YEAR IN GAS ALONE!"

HERE'S Mr. Chaddick's letter: "I had a show-down before I bought and Dodge is the only low-priced truck I could afford to buy. In comparing Dodge with the others, I checked gas economy and I checked upkeep and the way Dodge led simply astonished me. My comparative figures show that now I'm saving over $90 this year in gas alone."

What Mr. Chaddick says is repeated by thousands of shrewd truck buyers who compared Dodge feature by feature with the other lowest-priced trucks. Today there is no need to depend on claims or to buy a truck on mere habit. Anyone can take the simple, easy-to-understand Dodge show-down chart and compare values for himself. This chart is free at your Dodge dealer's. Learn how to get the most value for your truck dollars. Drop in and see your Dodge dealer or 'phone him today.

DODGE
Division of Chrysler Corporation
**List prices at factory, Detroit, subject to change without notice. Special equipment, including dual wheels on 1½-ton models, extra. Time payments to fit your budget. Ask for the official Chrysler Motors Commercial Credit Plan.*

$365*
½-ton chassis, 111½" w. b., 6 cylinders.

Dependable **DODGE TRUCKS**

One of the Dirt Moving Units with a Full Load on the Platte River Valley Irrigation Project in Nebraska

Huge Dirt-Moving Job On Platte River Project

Now that 3,000,000 yards have been scooped out of Platte River Valley to form the vast Sutherland reservoir, work is being rushed on the other part of this tremendous power and irrigation project, this latter involving the moving of more than 2,300,000 yards of earth. The dirt moving on this $7,200,000 job will be completed by December 1.

A few miles west of Keystone, Nebr., on the north branch of the Platte River, a dam is being built to divert water into a canal extending for about 18 miles along the foothills of the valley on the south side of the North Platte River. This canal empties into a large open cut, the construction of which involves about 2,500,000 yards of excavation, and carries the water from the North Platte Valley to the South Platte Valley to a siphon which goes under U.S. Highway No. 30, the main line of the Union Pacific Railroad and the South Platte River to the foothills on the south side of the South Platte Valley. Here the canal goes generally east for about 10 miles to the main reservoir about 3 miles south of Sutherland.

The canal then runs for about 17 miles east and 4 miles south to the regulating reservoir about 7 miles south of North Platte. From there a mile or two of canal extends to the forebay just above the power house, which is at the low point of the hills to the south of the South Platte Valley. Water runs from the power house through a canal to the South Platte River.

The principal or Sutherland reservoir involved about 3,000,000 yards of dirt. The dam of the regulating reservoir is about 8,800 feet long, the maximum fill is approximately 44 feet and the top of the dam will be 20 feet wide.

Preparing and Compacting Soil

The method of preparing the soil for compacting on this job is unusual. The dirt is placed on the fill in lifts not to exceed 5 inches. Then truck-drawn sprinkler wagons move over the fill spreading a predetermined amount of moisture. Most of this dirt will not readily mix with water, so the next step is the mixing of the soil and water with disc-harrows to get the correct consistency. As the last step, sheepsfoot rollers are pulled in tandem over the wetted and disked fill, passing over it five times.

Contractors and Their Equipment

Peter Kiewit Sons Co. is the general contractor for the regulating reservoir, canals from the regulating reservoir to the forebay and the forebay work and in addition subbed 1,000,000 of the 3,000,000 yards of dirt moving for the Sutherland reservoir for which George W. Condon Co. was the subcontractor.

The Kiewit organization used seventeen Caterpillar tractors, of which thirteen were diesels, eight Le Tourneau 12-yard and one 8-yard Carry-All scrapers, several Le Tourneau sheepsfoot rollers, a large Le Tourneau rooter and a bulldozer, all powered by Seventy-Five tractors.

Nine scrapers moved about 250,000 yards of cut in 25 working days of one month, 22 hours being considered one day. The average haul was 500 to 600 feet. The maximum rise from the bottom of the borrow pit to the top of the fill during this month was 35 feet.

The working conditions on this project are difficult. The climate of Nebraska is one of extremes and equipment working through the cycle of seasons faces 100-degree heat as well as bitter cold. The ground presents another set of extremes, charging the air with powdery dust when dry, then changing to a jellied quaking surface of oozing mud after a downpour. However, in spite of this, good progress has been made.

Need for Definite Design for Concrete Mixes

So much has been written on the subject of the design of concrete mixes for pavements that it may be thought that the basic principles of concrete mix design are so well understood that further comment is superfluous, said R. W. Crum in a recent issue of Highway Research Abstracts. However it is Mr. Crum's belief that there are some phases of this subject which need further investigation.

With proper attention to the understood basic principles, mixtures can be designed for any specific conditions with certain limitations—limitations, because the best practice recognized in this country requires the use of trial mixes which to some extent refutes the postulate that the mixes are designed, for the word "design" does not usually connote subsequent trial and error methods.

Since the quality of concrete is principally dependent upon the relative amounts of cement and water in the mixture, the design of mixtures is largely a matter of deciding upon the water-cement ratio and the amount and grading of aggregates that will produce workable concrete most economically. To decide upon the exact combination that will produce suitable workability requires trial mixes and, in the case of concrete for pavements, even trial mixes fall down because there is no known way of relating the workability of laboratory batches to the workability on the road under the placing conditions prevailing there.

An important point in specifying mixtures for pavements is that if proportions are arranged before the letting of the contract so that bidders can be assured the cement required for the job will not vary from the estimate, substantial savings will result.

The chief stumbling block to the research work preparatory to working out such a method is the lack of a test for workability that will identify the consistency of a mixture that will work properly when placed on the road. When such a test becomes available, a first use of it that must be made is a study of the relation of the characteristics of aggregates to workability of concrete. Placement by vibration has recently introduced a new factor in the workability problem which must be studied in relation to proportioning.

For large organizations, familiar with their materials and fully equipped with laboratory facilities, trial methods are adequate and satisfactory, but there are many situations where some more definite design methods would be most welcome.

Dependable 2" to 8" Self-Priming PUMPS

The choice of Contractors from coast to coast

Write for copy of our combined catalog and valuable bulletin of engineering data —sent FREE on request.

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LEADING THE MIXER FIELD

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COMPLETENESS OF LINE

MODERN DESIGN

LOWER PRICES

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Write for new bulletin on Wonder Tilting Mixers, Hoists, Pumps, Wheel Barrows, Master & Silverstreak Drum-Type Mixers, Saw Rigs, Plaster and Mortar Mixers, Concrete Carts.

CONSTRUCTION MACHINERY COMPANY 500 Glenwood Street Waterloo, Iowa

MARTINDALE SAFETY ROAD SIGNAL

FOUR SIGNAL STANDARDS

THIRTY STOCK SIGNS

Lift the signal and the tripod base opens up. Then simply insert your flag and snap on your sign.

—It's as simple as that!

Martindale Safety Signals are safer because motorists pay more attention to them.

—Bulletin 322 tells about it. Write today!

MARTINDALE ELECTRIC CO.

1387 HIRD AVE. CLEVELAND, OHIO

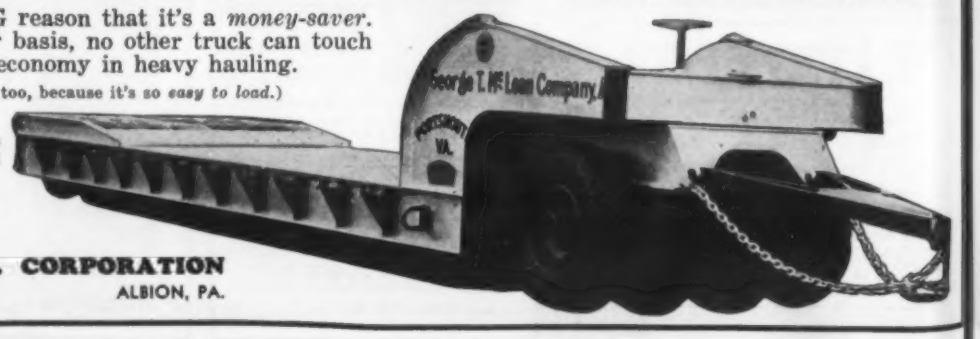
Why do contractors like the ROGERS?

—For the one BIG reason that it's a *money-saver*. On a cost-per-year basis, no other truck can touch the ROGERS for economy in heavy hauling.

(They like it, too, because it's so *easy to load*.)

Sizes range from 10 tons, 4-wheel, to 45 tons, 12-wheel.

Write for booklet



ROGERS BROS. CORPORATION
108 ORCHARD ST., ALBION, PA.

Portable Laboratory Tests Earth Density

Novel Method Insures Suitable Material for Earth Dikes on Loup River Project

THE construction of the earth dikes for the intake canal of the Columbus power house of the Loup River Public Power Project between Columbus and Genoa, Nebr., requires that the material be compacted to form the most dense structure possible. To control this to the highest degree, portable earth laboratories have been developed which are pulled ahead as the work progresses and kept close to the section where the earth is being placed. Thus there is no question later that the contractor may have used material unsuitable or not of the proper moisture content. It is determined on the spot as each load of material is placed.

The portable earth laboratories are 5 x 7 feet in plan, of wood frame construction with 8-inch ship lap sheathing lined with Sisalkraft paper. A small bench with a shelf below comprises the laboratory and on it are the gasoline stove, scales, and paraffine kettle for coating the specimens tested. Two seats, made by diagonal boards in the corners provide a place for the inspectors to rest while working up their notes.

Testing the Earth

Samples of the material for testing are taken frequently, and every time there is any evidence of a change in the type of material or the apparent moisture content. A sample is taken from the top lift of the material being placed at the time and also another 20 inches below. Care is exercised that the material is undisturbed. The samples are about intermediate in size between a baseball and a "soft ball." They are weighed, and then covered with hot paraffine, reweighed to determine the weight of the paraffine, and then weighed in water to determine the specific gravity of the earth sample.

An excellent set of tables and graphs has been worked out to give the inspector the exact amount of water that should be added per cubic yard of material represented by the sample to give the maximum density of compacted material in the dike.

In preparing the sample for testing with the plasticity needle developed by Proctor of California the loose fine dirt is placed in a brass cylinder which has a capacity of one-twentieth of a cubic foot, but a section of equal capacity is screwed to the top to permit packing a larger amount of material in the cylinder to give a uniform sample when the top section is removed. The material is placed in the cylinder in three layers, each of which is rodded twenty times, then the top portion of the cylinder is removed, the sample cut clean at the top of the lower half, giving the exact volume.

A Proctor plasticity needle of 1/10-inch area is used for reading when pushing into the sample, giving the actual pounds of resistance of the sample.

The portable earth laboratories were developed by K. H. Talbot who is in charge of both earth testing and concrete control. Harza Engineering Co., of Chicago, Ill., are Consulting and Construction Engineers for the Loup River Public Power Project.

New Dealer for Guard Rail

The Western Cataphote Co., Toledo, Ohio, has been appointed national distributor for Tyton guard rail and Berloy plate guard rail, made by the Berger Mfg. Co., Division of Republic Steel Corp., Canton, Ohio.

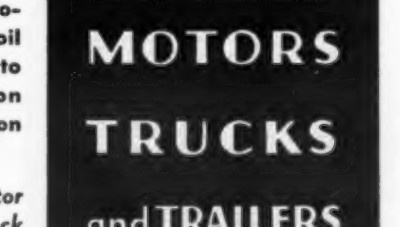
Lidgerwood Takes Over Mundy

The Lidgerwood Manufacturing Co., of Elizabeth, N. J., has announced the recent acquisition of the J. S. Mundy Hoisting Engine Co., of Newark. The Mundy company will continue the manufacture of the Mundy line of hoisting equipment, as well as service Mundy machinery now in the field.

Communications to this company should now be addressed to the J. S. Mundy Hoisting Engine Co., P. O. Box 18, Elizabeth, N. J.

COMPLETE
CUTTING AND WELDING APPARATUS
for all types of light and heavy work. Torches, tips regulators, hose, goggles, gloves, lighters and wrenches. Low prices—highest quality materials and workmanship.
Write for catalog
The Alexander Milburn Co.
1409 W. Baltimore St. . . . . Baltimore, Md.

"The Strongest Geared Power for Its Weight in the World"—
BEEBE ALL-STEEL HAND HOIST
THREE SIZES Two Ton "Lightweight" Five Ton "General Utility" 15 Ton "Special"
COMPACT—POWERFUL—SAFE
Positive internal brake—Two quickly shifted speeds—Adjustable length crank handle—Anti-friction babbitt bearings—Spring-operated safety dog.
Literature and list of dealers on request.
BEEBE BROS.
2724 Sixth Ave., South
SEATTLE, WASH.



Costs less to own for 3 provable reasons

The GMC 1½-2 ton truck—the truck of value with 47 important quality features—costs less to run for three definite reasons. Owners have proved it and logic confirms it.

1. DOES MORE WORK—Vital superiorities, such as greater payload capacity, higher sustained engine torque, greater horsepower, less deadweight and many other features of design, naturally assure more work per day and per year—enable owners to make greater profits.

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1½-22 TONS
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Bulletins and Pamphlets

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Oil-Engine Tractors

510 Complete information on A-C oil-engine tractors, which are claimed to offer fuel economy, power and long life, may be secured direct from the Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee, Wis.

Belt Conveyors and Accessories

511 Conweigh belt conveyors, idlers and accessories for construction jobs, large or small, are described in literature of the Portable Machinery Co., Division of A. B. Farquhar Co., Ltd., Box C-1, York, Pa., who will be glad to prepare layouts, sketches, blue-prints and quotations upon request.

Snow Plows for Truck Mounting

512 Walsh Holyoke blade and V-type snow plows in various models for mounting on heavy-duty or light trucks are described and illustrated in literature which the Walsh Holyoke Steam Boiler Works, Inc., Holyoke, Mass., will be glad to send to interested state and county highway engineers.

Handbook of Industrial Tires

513 A new 24-page Handbook of Industrial Tires, recently published by the B. F. Goodrich Co., Akron, Ohio, contains much valuable information for the user of tires, including how to select the right tire for a particular job, a description of the various types of tires, and size and specification tables. Copies of this booklet may be secured direct from the company by readers of this magazine.

External and Internal Concrete Vibrators

514 Electric Tamper & Equipment Co., Ludington, Mich., will be glad to send on request complete information on Jackson concrete vibrators, in various sizes, external and internal types, for jobs of all kinds and sizes requiring the placing of dense, strong concrete.

Power Shovels in Action

515 A free copy of "American Gopher Shovels" containing many action pictures of American shovels on the job is available to interested contractors and engineers who write direct to the American Hoist & Derrick Co., St. Paul, Minn.

Oil Engines for Heavy-Duty Service

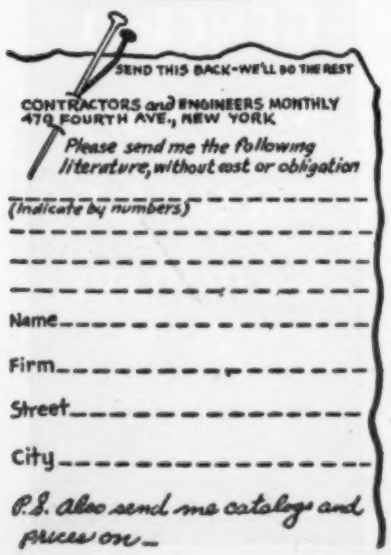
516 Bulletin 1,000, describing Waukesha-Hesselman oil engines, Model WFH of which operated an air compressor for 29,000 consecutive machine hours, with a cost for maintenance for both engine and compressor of $210.50, may be secured by those interested direct from the Waukesha Motor Co., Waukesha, Wis.

Air Compressor for Truck Mounting

517 Gordon Smith & Co., Inc., 1220 State St., Bowling Green, Ky., will be glad to send complete information on its Smith air compressor designed for use with a Model A or B Ford motor, for such jobs as drilling rock, pavement breaking, spray painting, etc.

Complete Line of Tractors

518 International Harvester Co. of America, Inc., 606 So. Michigan Ave., Chicago, Ill., will be glad to send complete information on the McCormick-Deering line of tractors, both wheel and crawler types, with gasoline or diesel power, all designed for long life and low operating costs.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New 2½-Yard Convertible Excavator

519 Bulletin 85-B, describing the new Bucyrus-Erie 85-B 2½-yard convertible excavator, features of which are its fast operating speed, quick convertibility, ease of operation and ease of shipment, may be secured direct from the Bucyrus-Erie Co., South Milwaukee, Wis.

Cold-Rolled Fluted Steel Pile Shells

520 A new illustrated folder has recently been issued by The Union Metal Mfg. Co., Canton, Ohio, which completely describes and illustrates Union Metal fluted steel pile shells which are cold-rolled for tapered cast-in-place concrete piles.

Sharpeners for Rock Bits

521 C. H. Carlson Mfg. Co., 13-15 Main St., N. E., Minneapolis, Minn., will be glad to send to those interested complete information on Quick-Way bit grinders, electric or belt drive with 2-hp gasoline engine, for resharpening detachable rock bits.

Cut the Cost of Winter Operations

522 J. & S. traction treads for use on dual tired trucks, tractors, motor graders, etc., which put every ounce of engine power into your tractor wheels in snow and ice and are made in two style shoes, with grouters integral or with quick detachable grouters, are described in literature which may be secured from W. A. Riddell Co., Department C, Bucyrus, Ohio.

Laying Pipe Under Pavement

523 Bulletin No. 15-E describes in detail the Young road crossing boring machine for installing pipe lines under paved highways, railroad crossings, etc. Copies may be secured by interested contractors and engineers direct from Young Engine Corp., Canton, Ohio.

A Manual of Concrete Curing

524 A new leather-bound manual giving complete details for curing concrete in all kinds of weather with calcium chloride has just been issued by The Columbia Alkali Corp., Barberton, Ohio. It is pocket size, flexible, contains 54 pages of text and 32 pages ruled for notes. It also contains many useful tables. You may secure a copy for your use by mentioning CONTRACTORS AND ENGINEERS MONTHLY in writing to The Columbia Alkali Corp.

Clean Sand and Gravel

525 Bulletin W-2 describing Eagle washers for sand and gravel in the screw and paddle type in sizes to suit capacity requirements may be secured by interested contractors from the Eagle Iron Works, Des Moines, Iowa.

Wire Nails and Other Wire Products

526 A convenient-sized 72-page illustrated booklet, describing the various types of wire nails and other wire products manufactured by the Bethlehem Steel Corp., Bethlehem, Pa., has recently been issued by that company. Copies of this Catalog W-3 are available upon request.

Factory Rebuilt Equipment

527 Full details and prices on factory rebuilt clamshell buckets, truck loaders and belt conveyors may be secured by interested contractors from George Haiss Mfg. Co., Inc., Canal Pl. & E. 142nd St., New York City.

Dewatering with Wellpoints

528 Catalog A, describing the Griffin Jet 'N Drive wellpoints, features of which are its Interflow design and large screen area to prevent clogging, may be secured by interested contractors from the Griffin Wellpoint Corp., 60 E. 42nd St., New York City.

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Something New in Grader Design

529 The new Huber motor grader is of different design, built like a bulldozer to push from the rear instead of pulling from the front. Complete details on this new unit are contained in Bulletin No. 400 which the Huber Manufacturing Co., Marion, Ohio, will be glad to send on request.

An Adjustable Bituminous Spreader

530 Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, will be glad to send to interested contractors and highway engineers complete information on the Jaeger adjustable spreader for spreading stone, macadam and bituminous material, from 1 to 10 inches of loose material, in 8 to 11-foot widths.

Steel Sheet Piling for Shore Protection

531 Complete information on Bethlehem steel sheet piling and its use in sea walls and other shore protection structures may be secured direct from Kalman Steel Corp., subsidiary of Bethlehem Steel Corp., Bethlehem, Pa.

Vibrators for Concrete

532 Literature describing Mall concrete vibrators, gas or electric-driven, for eliminating honeycomb and producing quality concrete may be secured direct from the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill.

A "Rough and Ready" Pump

533 Described by the manufacturer as a "rough and ready" unit, the Cameron Motorpump, in a wide range of sizes and types, is designed for the heavy-duty service required on construction jobs. Complete information on this pump may be secured from the Ingersoll Rand Co., 11 Broadway, New York City.

Special Wire Ropes

534 Williamsport Wire Rope Co., 122 So. Michigan Ave., Chicago, Ill., developed many new special wire ropes for specific uses and will be glad to make suggestions as to how to solve any complex wire rope problems, if you write direct to them stating the difficulty and mention CONTRACTORS AND ENGINEERS MONTHLY.

Diesel Electric Generator Set

535 Caterpillar diesel electric generator sets, available in five sizes ranging from 60 kw to 25 kw in both alternating and direct current models, are described in Form 2860 and other literature of the Caterpillar Tractor Co., Peoria, Ill. The manufacturer claims that this is "the cheaper way to produce electrical power."

New Three-Axle Rollers

536 Complete information on the new Buffalo-Springfield special three-axle roller for all kinds of precision rolling, which introduces a new principle of automatic compression, may be secured by those interested from the Buffalo-Springfield Roller Co., Springfield, Ohio.

Heavy-Duty Construction Mixers

537 Three newly designed heavy-duty construction mixers in sizes 28-S, 56-S and 84-S recently announced by Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis., are described in a booklet which may be secured direct from the manufacturer.

Warning Signs for Safety

538 Ready Made warning signs to meet the various conditions in construction and on highways are described in literature which the Ready Made Sign Co., 45 E. 17th St., New York City, will be glad to send on request.

A Motor Grader for Maintenance Work

539 The Good Roads Autograder which is claimed to drive like a truck and is as easily handled, designed particularly for maintenance and patrol work, is described in literature which the Good Roads Machinery Corp., Kennett Square, Pa., will be glad to send on request to contractors and highway engineers.

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The New Westinghouse Floodlight for Lighting Night Work

New Portable Floodlights for Construction Jobs

New Universal floodlights with permanent reflectors for installation on construction jobs, for emergency work, and similar uses, have been announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These lights are available in two sizes, one for 300 or 500-watt lamps and the other for 750 or 1,000-watt lamps.

The diffusing aluminum reflector is claimed to have high efficiency and permanency, requiring a minimum of maintenance. The reflector has an elliptical contour which is designed to provide a wide angle of beam distribution and to serve as a body for the floodlight. Its open end is beaded and so designed as to provide a watertight joint when the lens holder ring and lens are properly clamped in position.

Each floodlight is equipped with a rectangular-shaped, cast-iron, hot galvanized base having two mounting holes suitable for cross-arm mounting or pipe-clamp and slip-fitter bases, and are supplied with 30 inches of weather-proof two-conductor rubber-covered asbestos-covered cable brought through a watertight gland.

Pittsburgh Office Moves

The Pittsburgh District Sales Office of the Republic Steel Corp., of Youngstown, Ohio, moved last month from 4th and Bingham Streets to 1832 Oliver Building. F. M. Welsh continues in charge of the office, assisted by his present staff.

The Union Drawn Steel Co., a Republic subsidiary, will move into an adjoining suite in the Oliver Building. W. C. Gullyes, District Sales Manager, will be in charge.

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Jointless Pipe Railings

All-welded all-steel jointless pipe railings for use as bridge and sidewalk railings are made by the Fabricated Steel Products Co., 365 Marshall St., Wheeling, W. Va. These railings are made of strong full weight black or galvanized plain or copper-bearing steel pipe and are accurately cut and fitted at the factory.

Special steel flanges, in keeping with the design of the railings themselves, are attached to posts by concealed welds which are made in recesses in the bottom of the flanges. These flanges are applicable to any angle necessary. All connections necessary for installations are done by welding, resulting in a pleasing and neat appearance of the final installation.

Literature describing and illustrating these railings and their various applications may be secured direct from the Fabricated Steel Products Co.

Hillsman New Sales Manager for Expansion Joint Co.

The American Concrete Expansion Joint Co., 221 No. LaSalle St., Chicago, Ill., manufacturer of the Ace copper-sealed expansion joint for concrete roads, has announced the appointment of George E. Hillsman as Sales Manager. Mr. Hillsman has been associated with the highway construction business for over 25 years, having been President of The G. E. Hillsman Co., and later Secretary-Treasurer of the Lowe Hillsman Co., distributors of construction equipment and supplies in the Middle West. He was a member and director of the Associated Equipment Distributors.

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PEDLAR PEOPLE'S Culverts

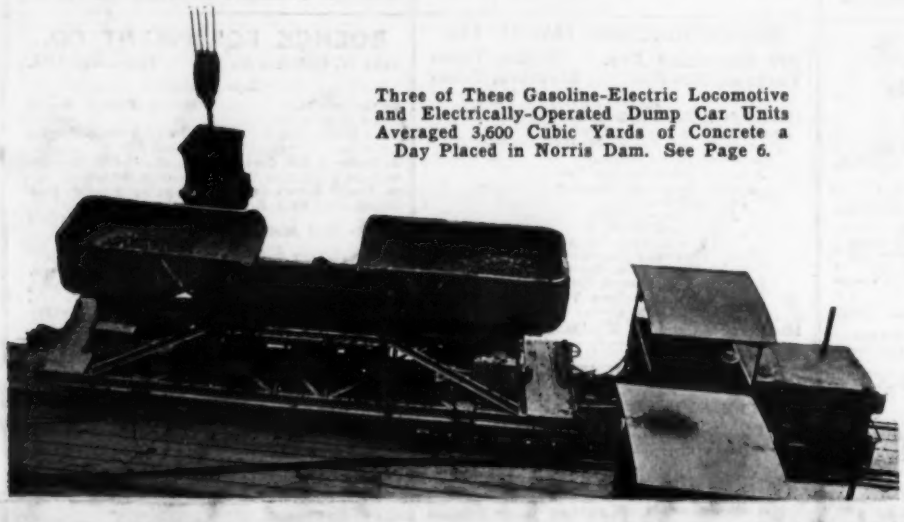
Contractors and Engineers Monthly

Caterpillar Tractor Co. Photo

Primitive Methods of Road Building and Maintenance Are Still a la Mode in Many Sections of Africa. The Scene Above Shows Camels Pulling a Drag Scraper On a Desert Road Southwest of Mazogan, Morocco.

Bureau of Foreign & Domestic Commerce Photo

Peace Time in Ethiopia. Emperor Haile Selassie and the Crown Prince (In Gray Cape) Inspect a New American Leaning-Wheel Grader in Operation on the Jimma Road. The Roads of Africa Are Described on Page 1.



Three of These Gasoline-Electric Locomotive and Electrically-Operated Dump Car Units Averaged 3,600 Cubic Yards of Concrete a Day Placed in Norris Dam. See Page 6.

Hoover Dam (Shown Below) Becomes Only a Speck on the Landscape When Viewed from the Air. Photo Shows Area of 200 Square Miles.

Fairchild Aerial Photo

Native Hawaiians Poised Precariously on Surf-Washed Rocks Guide Huge Boulders for the Port Allen Breakwater to Their Appointed Places. The Rocks Are of Hawaiian Lava Blasted out in the Contractor's Quarry a Mile from the Breakwater. See Page 5.

C. & E. M. Photo

Masonry Facing and End of Flat Arch of Overpass on New York's First Cloverleaf Grade Separation. See Page 2.

PWA Photo

Adjusting Wire Tension for the Rapidly Growing Cables of Tri-Borough Bridge in New York City.

A Curve Widened to 70 Feet on the Codell Construction Co. Repaving Contract in Covington, Ky. The Only Piece of Equipment Used on the Job is Shown Rolling the Widened Section. For a Complete Description of This Work, See Page 20.